INTERGENERATIONAL TRANSMISSION OF CHILD PROBLEM BEHAVIOR

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Intergenerational transmission of child problem behavior

Intergenerationele overdracht van probleemgedrag in de kindertijd

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Chapter 1

General introduction

In the present thesis, the intergenerational transmission of child problem behavior will be investigated. In this introduction, we will explain why it is important to study transmission of problem behavior from parents to their offspring. In addition, we will describe the study design that is suitable for this type of research, and give a description of its methodological advantages and difficulties. We will summarize previous studies that have used this type of design, and made an important contribution to the research in intergenerational transmission of child problem behavior. Two factors that are thought to be important in the intergenerational transmission of problem behavior, parenting and parental psychopathology, will also be described. In addition, we will describe the possible relevance of developmental trajectories of problem behavior displayed by parents during their childhood, in predicting offspring problem behavior. Finally we will describe the aims, methods and structure of the present thesis.

The importance of studying intergenerational transmission of behavior

During the past century, there has been ongoing concern about the extent to which behavioral and emotional problems run in families, and continue across generations. Numerous studies have investigated intergenerational continuities in a wide range of characteristics such as depression, anxiety, aggression, substance use, teenage parenthood, smoking, partner violence and parenting behavior. The results of many of these studies indeed indicated the existence of intergenerational transmission of behavior (Bailey, Hill, Oesterle, & Hawkins, 2006; Beidel & Turner, 1997; Blazei, Iacono, & McGue, 2008; Chassin, Presson, Todd, Rose, & Sherman, 1998; Johnson, Cohen, Kasen, & Brook, 2006; Pears & Capaldi, 2001; Weissman et al., 2006).

Previous studies have also focused at possible explanations for the reported similarities in the behavior of parents and their children. From the results of these studies, it appears that the occurrence of intergenerational transmission of behavior is an interplay between genetic and environmental factors. Problem behavior in childhood is often associated with factors and circumstances unfavorable for child development, successful adult outcomes, and the development of the offspring of these adults. A child whose parents exhibit problem behavior may be genetically more vulnerable to develop this behavior, especially when the child grows up under non-optimal circumstances, which his parents are likely to provide. For example, children of teenage mothers are more likely to have their first child at an early age themselves (Hardy, Astone, Brooks-Gunn, Shapiro, & Miller, 1998). Early parenthood is correlated with many future disadvantages such as low education, family poverty, single parenthood and low occupational status (Bradley & Corwyn, 2002). In turn, these factors are predictors for offspring's cognitive, social-emotional and physical problems, which makes the intergenerational transmission of teenage parenthood more likely to occur.

Not only do intergenerational continuities in behavior concern individuals within families, they also concern practitioners and policy makers who find themselves at the challenge of cutting the costs for the mental and physical health system, and social welfare. The importance of research on intergenerational continuity has been recognized since it enables policy makers to develop new preventive intervention policies. Therefore, the processes by which parents place their children at risk for continuing their own problematic behaviors are important to uncover (Serbin & Karp, 2004).

Apart from the practical relevance, from a developmental perspective it is important to study intergenerational transmission of behavior as well. Basic theoretical and conceptual issues from the field of developmental psychology and developmental psychopathology can be explored by investigating the intergenerational transmission of different behaviors and psychopathology.

Although the issues being addressed are not new, recent longitudinal studies have made it possible to approach them from another perspective. In the following paragraph, the design and results of these longitudinal studies on intergenerational transmission of behavior will be described.

Longitudinal studies of intergenerational transmission

Cairns et al. (1998) identified three criteria for designing a study of intergenerational research. First, individuals in both generations should be observed at the same age or developmental stage. Second, information should be prospective rather than retrospective. Third, data should be obtained from multiple informants or measurement sources. It is clear that this is not an easy study design to accomplish. For example, there is the temporal aspect; it takes around 20 years to assess individuals of two generations at approximately the same age. Apart from the fact that this is a very long time to keep a study going, the length of the study brings methodological difficulties too (Serbin & Stack, 1998). Original measures have often become outdated, and researchers are forced to use other instruments. Also, researchers cannot go back in time to change the design of the study and make it better suitable for their current study goals. In addition, it is a challenge to maintain the sample all these years and prevent selective attrition from taking place. Every longitudinal study loses participants due to individuals who decide not to participate anymore, or because information is lost about the participants' whereabouts. Selective attrition, for example by losing the participants with the worst outcomes, is likely to bias the results of the study. In studies with high selective attrition, results cannot be generalized to the most severely disadvantaged individuals. Attrition, in general, can reduce sample size so much that it may reduce the power of the analyses to detect effects. To overcome these problems it is important to keep track of as many participants as possible.

However, once a study design meeting all the requirements (Cairns, Cairns, Xie, Leung, & Hearne, 1998) is accomplished, it has several advantages. Because of the temporal sequence, the study design provides the opportunity to construct and test models of causation. All collected information is usually prospective, so there are no retrospective biases in the data. When the sample is community-based, information about incidence and prevalence rates can be obtained within a population.

Only a few studies have managed to examine intergenerational transmission of child behavior with a longitudinal study design, assessing both parent and child in childhood. In the following section, these studies and their results will be discussed.

Results of previous studies on intergenerational transmission of child problem behavior

Three studies that focus mainly on the intergenerational transmission of child problem behavior will be discussed in this section. The first study used an American community-based sample, to determine the stability of two dimensions of childhood behavior between two generations. In this study, a significant relation was found between parental inhibited behavior in childhood and offspring inhibited behavior. No significant transmission effect was found for the dimension of difficult behavior, which implies a negative mood, impulsivity and resistance to distraction from desired objects or activities. Furthermore, the relationship was stronger when the age of assessment of the parent was closer to the age of assessment of the child (Cohen, Kasen, Brook, & Hartmark, 1998). This result strengthens the thought that parents and children are better comparable when they are at the same age or in the same developmental stage. In a longitudinal Canadian study using a high-risk female sample, intergenerational transmission of risk was examined. Mothers' childhood aggression significantly predicted offspring's unresponsiveness and mothers' childhood withdrawn behavior significantly predicted offspring's aggression (Serbin et al., 1998). Finally, in another American high-risk sample consisting of young mothers, the aggressive behavior of these mothers when they were children was compared to the aggressive behavior of their offspring (Cairns et al., 1998). No intergenerational transmission of aggressive behavior was found.

Although the extent to which intergenerational transmission of problem behavior was found in these studies differs, the results of these studies indicate that intergenerational transmission of child behavior may indeed exist. Despite the unique and strong design of these studies, they leave some questions unanswered. First, because they focus on only one or two types of behavior, they were unable to compare the extent to which intergenerational transmission takes place in different behaviors. Second, sample sizes were not very large; only the sample of the Cohen study (Cohen et al., 1998) exceeded one hundred first generation participants. Third, two of these three studies were based on a high-risk sample. High-risk

samples focus on the extremes of a population, and mechanisms of transmission may be different from the general population. It is therefore important to replicate the results of these studies in a general population sample.

Risk factors for intergenerational transmission of behavior

First of all, genes can be seen as a major factor in the intergenerational transmission of problem behavior. Behavioral genetics have shown us that a large part of behavioral variance can be explained by genetic factors (Bartels et al., 2006; Bartels et al., 2004). With regard to the development of problem behavior, genes do not operate by themselves. The expression of genetic influences is responsive to the social environment. It appears that the social environment plays a necessary and specific role in the expression of particular genetic influences on a broad range of behaviors (Reiss & Neiderhiser, 2000). Genes may be connected with environmental factors through several mechanisms. First, there is gene-environment correlation. A distinction is made between active and passive gene-environment correlation. Active gene-environment correlation refers to the genetically influenced tendency for individuals to seek, create or otherwise end up in particular environments (Rutter & Silberg, 2002). Passive gene-environment correlation refers to the association between the genotype a child inherits from it's parents and the environment in which the child is raised. There is often an association between the environment that the parent provides and the behavior of the child, but the environment may only be a marker for the genetic risk that the parents transmit to their children, and not the cause of the development of child problem behavior (Jaffee & Price, 2007). Gene-environment interaction refers to genetic differences in susceptibility to particular environments (Jaffee & Price, 2007).

To separate genetic and environmental influences, it is necessary to use a genetic sensitive design such as a twins or adoption design. Our present study and the studies on intergenerational transmission of child behavior that we described do not have a design like this. Therefore, it is in the present study not possible to separate genetic from environmental influences, and we focus on the role of environmental influences.

Many studies have explored the associations of environmental factors with the development of child problem behavior. For example, relations between teenage parenthood (Hardy et al., 1998), low parental educational achievement and low parental SES (Bradley & Corwyn, 2002), and child problem behavior have been well established. However, it is unclear whether these factors themselves cause the development of child problem behavior, or whether there are other, mediating factors that explain the relation between these factors and child problem behavior.

Two parental factors seem to be core factors in the development of child problem behavior because they appear to influence the environment of the child directly, and in this way

evoke the development of child problem behavior. These two factors, parenting and parental psychopathology have received much attention in the existing research on transmission of problem behavior. Because these factors are included in the present research as well, they will be discussed in more detail in the following paragraphs.

Parenting

The general life-course perspective on human development (Elder & Shanahan, 2006) poses that human development takes place in the context of intertwined social relationships, and that the shape of one's life course is influenced by the shape of the life courses of others. The experiences and attributes of one generation are passed on to the young through relationships between generations. This is the 'Linked Lives' perspective. One of the most intimate and influential of these relationships is that between parent and child. In developmental theories as well, parental behavior is seen as an important factor in the social, emotional and cognitive development of a child. It is therefore not surprising that parenting plays a key role in many models that have been proposed for the intergenerational transmission of risk for a broad range of developmental and social difficulties.

Although research results differ, associations between parenting and child behavior are found in most studies. The quality of parenting is found to be a predictor of offspring conduct problems in childhood and in adolescence (Feinberg, Button, Neiderhiser, Reiss, & Hetherington, 2007; Simons, Chao, & Conger, 2001; Snyder, Cramer, Afrank, & Patterson, 2005; Trentacosta & Shaw, 2008). In addition, maladaptive parenting was found to be associated with childhood anxiety and depression (Gruner, Muris, & Merckelbach, 1999; McLeod, Weisz, & Wood, 2007; McLeod, Wood, & Weisz, 2007). Furthermore, maladaptive parenting appears to be related to offspring psychiatric disorders in adulthood as well (Johnson, Cohen, Chen, Kasen, & Brook, 2006; Johnson, Cohen, Kasen, Smailes, & Brook, 2001; Reti et al., 2002). Taking these results into account, several studies have included parenting in the models they designed to explain intergenerational transmission of child behavior.

Parental psychopathology

Many studies have shown the association between parental psychopathology and child problem behavior. For example, parental depression has been found to be associated with a broad range of offspring problems. Not only does parental depression predict offspring depression in adolescence and adulthood (Weissman et al., 2006), it also predicts other internalizing and externalizing behaviors (Burt et al., 2005; Frye & Garber, 2005), including antisocial behavior (Kim-Cohen, Moffitt, Taylor, Pawlby, & Caspi, 2005). Furthermore, parental anxiety predicts anxiety and depression in offspring (Beidel & Turner, 1997; McClure, Brennan, Hammen, & Le Brocque, 2001; Merikangas, Dierker, & Szatmari, 1998). Parental antisocial behavior has been found to be associated with a large range of internalizing and externalizing problems in offspring (Herndon & Iacono, 2005), including aggressive behavior (Huijbregts, Seguin,

Zoccolillo, Boivin, & Tremblay, 2008), anxiety and depression (Johnson, Cohen, Kasen et al., 2006).

The explanations for the associations between parental psychopathology and offspring problem behavior are manifold. One explanation is genetic; parents and children may share the genes that are responsible for the development of a psychiatric disorder. Another explanation is a more environmental explanation. When parents suffer from psychopathology, they will be less able to provide their child with an optimal environment. When a child is raised in a non-optimal setting, it will be more likely to develop problem behavior. It is plausible that interaction takes place between genes and environmental factors. The children may be more vulnerable to develop certain problem behavior due to their genes, and the non-optimal environment that their parents create due to their own problematic behavior facilitates the actual development of this vulnerability.

Longitudinal studies examining the associations between two generations of child problem behavior, parenting and parental psychopathology

Several studies have investigated the associations across two generations of child problem behavior, parenting and parental psychopathology. The goal of these studies was to uncover the mechanisms through which the intergenerational transmission of behavior takes place. The existing research has focused on externalizing behavior. In the study of Kaplan and Liu (1999), the transmission of antisocial behavior across two generations of adolescent females was partly mediated by current psychopathology of the mothers. Parenting did not have an additional effect. A study by Thornberry and colleagues (Thornberry, Freeman-Gallant, Lizotte, Krohn, & Smith, 2003) found that the mechanisms of intergenerational transmission of antisocial behavior differ for males versus females: for fathers, antisocial characteristics mediated the associations between two generations of child behavior, but for mothers it was parenting that mediated these associations. Two studies testing the associations between two generations of child externalizing behavior and parenting found that both parenting and adult antisocial behavior played a role in the intergenerational transmission of child externalizing behavior (Conger, Neppl, Kim, & Scaramella, 2003; Smith & Farrington, 2004).

These study results indicate that parenting and parental psychopathology play a role in the intergenerational transmission of externalizing behavior. However, the studies contradict each other on the exact roles of current psychopathology, parenting and the intergenerational transmission of parenting in the intergenerational transmission of behavior. In the studies of Conger and Smith, both parenting and parental psychopathology play a role; in the study of Kaplan & Liu only parental psychopathology matters; and in the study of Thornberry, it depends on the sex of the parent which factor contributes to the intergenerational transmis-

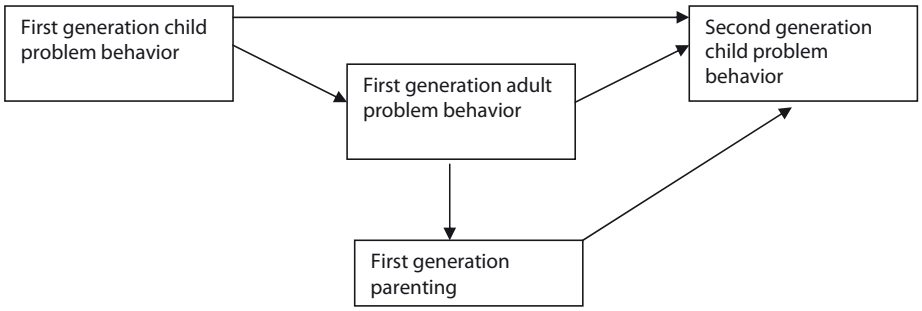
sion of behavior. Furthermore, most of these studies are high-risk studies and some have a small sample size (N<100). Therefore, it is hard to generalize the results of these studies to the general population.

A model for the roles of psychopathology and parenting in the intergenerational transmission of child behavior

Previous longitudinal studies indicated that child problem behavior often continues into adulthood. In a previous study report of the sample on which the present study was based, significant continuity was found between problem behavior of children aged 4-16 years and their problems in young adulthood 14 years later (Hofstra, Van der Ende, & Verhulst, 2000). In the longitudinal Dunedin study, continuity was found between children's behavior at age 3 and their adult personality traits and psychiatric disorders 23 years later (Caspi et al., 2003; Caspi, Moffitt, Newman, & Silva, 1996). Therefore, it is possible that intergenerational transmission of child problem behavior takes place through parental psychopathology. For example, an individual exhibits problem behavior in childhood. The individual enters adulthood and still has high levels of psychopathology. Then, when the individual becomes a parent, apart from passing over genes to his children, he will provide a non-optimal setting for his child, and the child will develop problem behavior itself. Although this possible mechanism of intergenerational transmission of child problem behavior sounds plausible, it is important to test it in a study with a population-based sample in which both generations are assessed in their childhood.

As was shown in the studies described earlier, parenting behavior seems to play a role in the intergenerational transmission of child behavior as well. However, none of these studies tested parental psychopathology and parenting as mechanisms of child problem behavior simultaneously. It has been theorized that parental psychopathology influences the capacity of a parent to raise a child in an adequate way (Belsky, 1984). When this is indeed the case, parenting may play an indirect role in the intergenerational transmission of child behavior. Figure 1.1 shows our model for intergenerational transmission of child behavior. In this model, child problem behavior predicts parental psychopathology in adulthood. Parental psychopathology predicts parenting and offspring problem behavior. In addition, parenting predicts offspring problem behavior. This model has not yet been tested in the existing longitudinal studies.

Figure 1.1 Model for intergenerational transmission of child problem behavior.



Trajectories of behavior

Studies on intergenerational transmission of child problem behavior generally assess parents at only one time point (i.e. in childhood, in adolescence or in adulthood). They then compare this measure to offspring behavior. Both ways of comparing problem behavior in two generations do not take into account the development of problem behavior. In the last decennia, longitudinal studies have provided evidence for the existence of individual differences in development. This means that two individuals exposing similar levels of problem behavior at one specific point in time do not need to follow similar trajectories of problem behavior because they may belong to different sub-populations with regard to their development of behavior. Associations between parental and offspring behavior may be missed when the development of parental behavior is not considered.

Previous studies have found several developmental trajectories for internalizing and externalizing behavior (Brendgen, Wanner, Morin, & Vitaro, 2005; Broidy et al., 2003; Odgers et al., 2008; Sterba, Prinstein, & Cox, 2007; Stoolmiller, Kim, & Capaldi, 2005). For internalizing behavior, most studies found one trajectory with individuals who were consequently low on internalizing behavior and one trajectory with individuals who were consequently high on internalizing behavior. The other trajectories that were reported varied. Some studies found trajectories in which the level of internalizing behavior increased (Brendgen et al., 2005), some found trajectories in which the level of internalizing behavior decreased (Stoolmiller et al., 2005) , and some found trajectories in which trajectories both increased and decreased(Campbell, Matestic, von Stauffenberg, Mohan, & Kirchner, 2007; Dekker et al., 2007; Sterba et al., 2007). With regard to externalizing trajectories, almost all studies found a trajectory with individuals who were consequently low on externalizing behavior, and one trajectory with individuals consequently high on externalizing behavior (Broidy et al., 2003). Another common trajectory is the adolescent increasing trajectory; children who are low on externalizing behavior in childhood, but start developing this behavior during adolescence (Odgers et al., 2008).

The relation between parental developmental trajectories of child problem behavior and problem behavior in offspring has not yet been investigated in previous studies. In the present thesis, we explore the associations between internalizing and externalizing trajectories of parents in childhood and adolescence, and internalizing and externalizing offspring behavior.

The present study, aims and methods, structure of this thesis

Aims

The study described in this thesis aims to offer insight in the intergenerational transmission of child problem behavior. More specifically, the following research questions will be addressed in this thesis:

1. To what extent do different types of problem behaviors in childhood and adolescence continue across generations?
2. What role do current parental problem behavior and parenting play in the intergenerational transmission of problem behavior?
3. Do parental trajectories of internalizing and externalizing problem behavior during childhood and adolescence predict offspring internalizing and externalizing behavior?

Methods

1983 Sample (Generation 1)

The data for the present study were collected within the 7th wave of the Zuid-Holland Study, a longitudinal, community-based study that started in 1983 (Verhulst, Akkerhuis, & Althaus, 1985; Verhulst, Berden, & Sanders-Woudstra, 1985). The original 1983 sample consisted of 2600 children between 4 and 16 years old. The parents of 2447 children were reached, and 2076 cooperated by completing the Child Behavior Checklist (Achenbach & Rescorla, 2001b), a widely used parent questionnaire, on the behavior of their child. Follow-up assessments took place in 1985, 1987, 1989, 1991 and 1997.

2007 Sample (Generation 2)

From 2006 to 2007 the 7th wave of the study was carried out. Again, the 2076 individuals were contacted and asked to participate in the 7th wave of the study. The individuals that agreed to participate were also asked to provide information on the behavior of their children by filling out the Child Behavior Checklist.

Of the 1365 G1 participants in the 7th wave of the Zuid-Holland Study, 775 (57%) had a total of 1407 children. Participants with children were compared to participants without children by using logistic regression. Participants with children tended to be older (mean age

at baseline was 11.4 for participants with children and 8.8 for participants without children, OR:1.24, p<.01), female (of all participants 48% of the females and 31% of the males have children, OR:2.30, p<.01) and to have a lower socioeconomic status (SES) (3.4 for participants with children and 3.8 for participants without children, OR:.83, p<.01) than participants without children. Of the participants with children, 14 refused to provide information about their children, and 137 participants did not return the questionnaires about their children. Two different versions of the CBCL were used. Depending on the age of the G2 children, the CBCL/1.5-5 (Achenbach & Rescorla, 2001a) or the CBCL/6-18 (Achenbach & Rescorla, 2001b) was used. Five hundred and forty nine G1 participants filled in usable questionnaires on a total of 968 G2 children aged 1.5-18 years. Two hundred and eighty two of these 549 G1 participants had only one child; the other 267 G1 participants had two or more children. The mean age of the G1 children was 11.4 years, the mean age of the G2 children was 5.8 years. Information about the G1 and G2 samples is shown in Table 1.1.

To measure G1 participants' current psychopathology, we asked them to fill out the Adult Self-Report (ASR) (Achenbach & Rescorla, 2003), a self-report rating scale for assessing emotional and behavioral problems for ages 18 to 59 years that is modeled after the CBCL. To assess their parenting behavior, we asked the G1 participants to fill out the EMBU-P (Markus, 2003), which is a diversion of the original EMBU, and has been developed as a self-report for parents' current parenting towards their own children.

Table 1.1 Sex and age of participating children

	4-5 years	6-11 years	12-18 years	**Total**
Boys	11	66	117	194
Girls	21	154	180	355
Total	32	220	297	549

Generation 1 children, measured in 1983

	1.5-5 years	6-18 years	12-18 years	**Total**
Boys	290	174	48	512
Girls	241	177	38	456
total	531	351	86	968

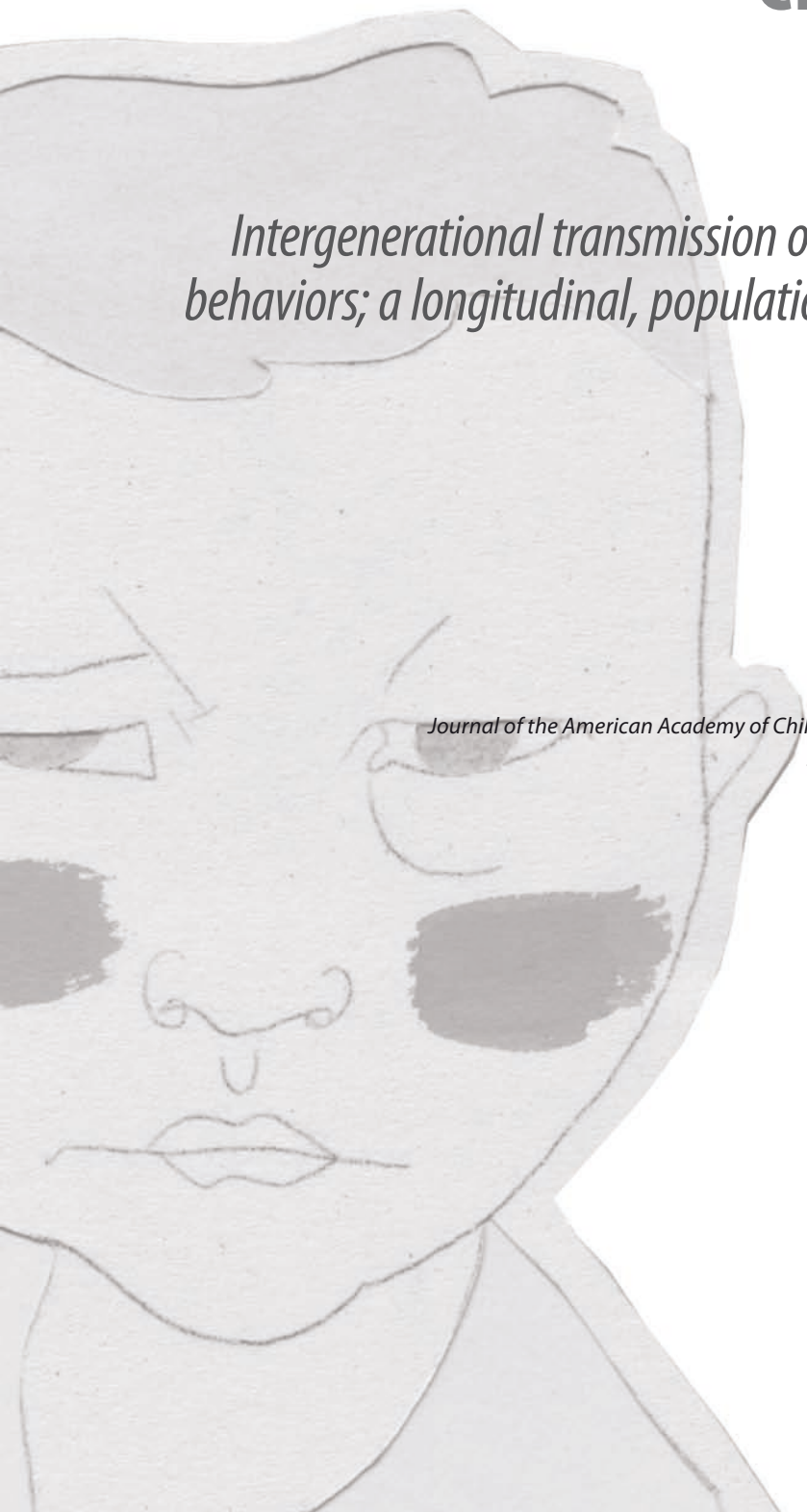
Generation 2 children, measured in 2007

Structure of this thesis

In chapter 2, the intergenerational transmission of child behavior was investigated for a broad range of problem behaviors. In chapter 3, we examined to what extent current parental psychopathology and parenting explain the relationship between internalizing and externalizing behavior of parents in childhood and the internalizing and externalizing behavior of their offspring. In chapter 4, we explore the role of intergenerational transmission of parenting in the intergenerational transmission of child internalizing and externalizing

behavior. In chapter 5, parental trajectories of internalizing behavior were conducted, and the associations between these trajectories and their offspring's internalizing and externalizing behavior were investigated. In chapter 6, parental trajectories of externalizing behavior were conducted. We examined the associations between these trajectories and offspring's externalizing and internalizing behavior. Chapter 7 provides a general discussion on the conclusions of the study described in this thesis.

Chapter 2



Intergenerational transmission of child problem behaviors; a longitudinal, population-based study

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Abstract

Objective: From a developmental perspective it is important to know to what extent childhood problem behaviors are transmitted across generations. In a longitudinal community study, we compared child behavior of parents with the behavior of their offspring. Intergenerational transmission was investigated for a broad range of problem behaviors, including internalizing problems and externalizing behavior. Sex differences were investigated as well.
Methods: We compared Child Behavior Checklist scores (CBCL) of 4-16-year-old children (N=271) from a community sample assessed in 1983 with CBCL scores of their 6-18-year-old offspring (N=424) who were assessed in 2007. Multilevel modeling was used to test intergenerational associations.
Results: Most forms of problem behavior in children were predicted by the behavior of their parents as children. Parents' Internalizing, Externalizing and Total Problem scores in childhood all predicted similar problems in their children. Sex differences were found for Delinquent Behavior: continuity was stronger in mothers than it was in fathers, and it was also stronger in sons than in daughters.
Conclusions: The finding that child behavior continues across generations poses challenges in finding ways to prevent problems from being transmitted across generations.

Introduction

From a developmental point of view it is important to know to what extent childhood problem behaviors tend to be transmitted into the next generation. Genetically informative studies, such as twin studies, have found that a considerable part of the variation in behavior between children can be explained by genetic influences (Bartels et al., 2006; Bartels et al., 2004; Boomsma, van Beijsterveldt, & Hudziak, 2005). These studies tell us about the proportions of the variance between individuals' problem behavior accounted for by genetic and environmental factors, but do not tell us to what extent child problem behaviors form a risk to be transmitted to the next generation. Family studies, in which psychopathology in parents is compared to that in their offspring, have shown that many types of child psychopathology run in families. However, most family studies have either compared current parental psychopathology to that in their offspring (Bifulco et al., 2002; Herndon & Iacono, 2005; Leinonen, Solantaus, & Punamaki, 2003), or used retrospective information about problem behaviors that parents had shown in their childhood (Bailey et al., 1999; Lichter, Dmochowski, Jackson, & Trinidad, 1999). Unfortunately, retrospective information from adults about behavioral or emotional problems in their childhood may suffer from recall bias (Kruijshaar et al., 2005; Offer, Kaiz, Howard, & Bennett, 2000) and comparing adult psychopathology to child psychopathology is difficult whereas the nature and expression of psychopathology differs between children and adults. To study the risk of childhood problem behavior that is transmitted to the next generation, we need to determine associations between adults' problem behavior assessed when they were children with that of their offspring's problem behavior using similar methodology. To improve the comparability between parents and children, assessment age of the offspring should be as close as possible to the assessment age of the parents (Cohen et al., 1998).

Only a few studies have investigated intergenerational transmission of child behavior with a prospective design (Cairns et al., 1998; Cohen et al., 1998; Kaplan & Liu, 1999; Serbin et al., 1998; Smith & Farrington, 2004; Thornberry et al., 2003). The study of Cohen et al. (Cohen et al., 1998), that determined the intergenerational stability of child inhibited and difficult behavior in males and females found a stability in inhibited, but not in difficult behavior. In addition, they found that the relationship was stronger when the age of parents was closer to the age of the offspring at the time they were assessed. Thornberry et al. (Thornberry et al., 2003) found transmission of parental adolescent delinquency to early antisocial behavior in their offspring and in a study of Kaplan and Liu (Kaplan & Liu, 1999) on adolescent female antisocial behavior, intergenerational continuities were found as well. However, not all studies had results indicating the presence of intergenerational transmission of behavior. In the studies of Cairns et al. (Cairns et al., 1998), and Smith & Farrington (Smith & Farrington, 2004), no intergenerational transmission of child externalizing behavior was found. The study of Serbin (Serbin et al., 1998), which was predicting offspring aggression and unresponsiveness

from maternal aggression and withdrawn child behavior, had marginally significant results. These contradictory results might have been due to methodological difficulties in the study designs: first, although sex differences might play an important role in the transmission of problem behavior (Connell & Goodman, 2002) some studies focused on parents of only one sex whereas others focused on both sexes. Secondly, several studies did not use similar instruments to measure parent and child, because instruments tend to become outdated after some years. Third, not all studies were able to measure parent and child at approximately the same age, which may compromise the generalizability of the findings. Finally, sample size sometimes turned out quite small; the studies of Serbin (Serbin et al., 1998) and Cairns (Cairns et al., 1998) used fewer than 100 parent-child pairs for their analyses.

In the present study investigating intergenerational transmission of child problem behavior, we expect to find evidence for the intergenerational transmission of different problem behaviors. The design of the present study has some major advantages. It is a prospective, longitudinal, population based study with a large sample size (N parents=271, N offspring=424). The same instrument is used to measure parents of both sexes in childhood and their offspring, which makes comparisons of behavior in the two generations easier. Finally, while existing studies focus on only one or two types of problem behavior, in the present study, a broad range of problem behavior is measured. To our knowledge, our study is the first to compare a broad range of child problem behaviors in parents and their offspring in a community sample, including both sexes and using the same measurement instrument in both generations.

Methods

Population and procedure

In this study we used data from the first and seventh wave of the Zuid-Holland study, a longitudinal population study that started in 1983. A random sample of 2600 children and adolescents from 4 to 16 years of age was drawn from municipal registers of the Dutch province of Zuid-Holland which encompasses both urban and rural areas. Parents were asked to complete the Child Behavior Checklist (Achenbach & Rescorla, 2001b) (CBCL) on the behavior of their child. Of the 2447 parents reached, 2076 (84,8%) provided usable information about their children. After the first measurement in 1983 (time 1), the sample was approached again in 1985 (time 2), 1987 (time 3), 1989 (time 4), 1991 (time 5), 1997 (time 6) and 2007 (time 7). For details on the initial data collection, see Verhulst (Verhulst, Akkerhuis et al., 1985).

For the 7th measurement, all participants, now aged 27 to 40, were contacted between January 2006 and July 2007, except for 23 who had died, 10 who were intellectually disabled and 264 who could not be traced. Usable information was provided by 1365 participants (66%). We used logistic regression to investigate if demographic characteristics were associ-

ated with participation at time 7. The participants at time 7 were more likely to be female, younger, and to have a higher SES. They also had a lower score on externalizing behavior at the first measurement than non-participants. In addition to providing information about their own behavior, all participants with children of 18 months or older were requested to fill in a questionnaire on their children's behavior. In this paper, the first generation participants are referred to as 'G1'and their children as 'G2' (Generation 2).

Of the 1365 G1 participants in the 7th wave of the Zuid-Holland Study, 775 (54%) had a total of 1407 children. Participants with children were compared to participants without children by using logistic regression. Participants with children tended to be older, female and to have a lower SES than participants without children. Of the participants with children, 14 refused to provide information about their children, and 137 participants did not return the questionnaires about their children. Two different versions of the CBCL were used. Depending on the age of the G2 children, the CBCL/1.5-5 or the CBCL/6-18 was used. In this study we only included children for whom the CBCL/6-18 was available. Two hundred and seventy one G1 participants filled in usable questionnaires on a total of 424 G2 children aged 6 years and older. One hundred and eighty two of these 271 G1 participants had only one child; the other 89 G1 participants had two or more children. Information about sample, attrition and follow-up is shown in Figure 2.1. The mean age of the G1 participants at first measurement was 12.8 years; the mean age of the G2 participants was 9.2 years. The mean age difference between G1 and G2 at first measurement is 4.5 years. The sex and age characteristics of the G1 and G2 children in this study are summarized in Table 2.1.

Figure 2.1 Attrition and follow-up

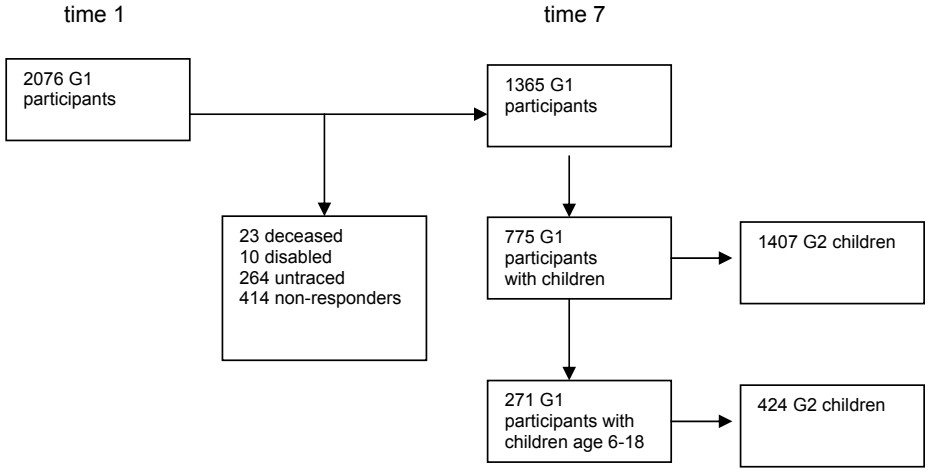

Table 2.1 sex and age of participating children

	4-11 years	12-16 years	**Total**
Boys	15	74	89
Girls	58	124	182
Total	73	198	271

Generation 1 children, measured in 1983

	6-11 years	12-18 years	**Total**
Boys	169	46	215
Girls	172	37	209
total	341	83	424

Generation 2 children, measured in 2007

Instruments

Child Behavior Checklist

The CBCL (Achenbach & Rescorla, 2001b) is a rating scale designed to assess behavioral and emotional problems in children. The CBCL is to be completed by parents and can be scored on eight syndrome scales and two broad-band groupings of syndromes: Internalizing, which consists of the Withdrawn, Anxious/Depressed and Somatic Complaints scales and Externalizing, which consists of the Aggressive Behavior and Delinquent Behavior scales. The three additional syndrome scales are Social Problems, Thought Problems and Attention Problems. A Total Problems score is derived by summing the individual item scores. Good reliability and validity of the CBCL have been replicated for the Dutch translation (Verhulst, Van der Ende, & Koot, 1996)

For the first measurement in 1983, the CBCL/4-16 was used. In 2007, we used the CBCL/6-18 which is a revision of the CBCL/4-16 (F. Verhulst et al., 1996). The CBCL/4-16 can be scored according to the 1991 scale compositions and the CBCL/6-18 can be scored according to the 2001 scale compositions. However, we scored both forms with the 1991 scale composition because both forms contain all the items that are needed to score the 1991 scales.

Statistical analyses

The CBCL reports of G1 behavior in 1983 were compared with the CBCL reports of G2 behavior in 2007. To predict G2 behavior on the basis of G1 behavior, a series of multilevel modeling analyses was performed using the SPSS Mixed Models procedure. Multilevel analyses (Boyle & Willms, 2001) were used to account for the within family clustering, because 34% of the

G1 participants had two or more participating children. A random intercept was included to each model, which made a significant contribution to the models (for all models, p<. 05).

We conducted separate analyses for each G2 syndrome scale. The G2 syndrome scale was the dependent variable and the matching G1 syndrome scale was the predictor in each analysis. Three additional models were conducted, with the two broad-band scales, i.e. Externalizing and Internalizing, and the Total Problems scale of G1 as predictors and the matching scale scores of G2 as dependent variables. In each model, the demographic variables sex, age and G1 SES were included as confounders. SES was scored on a five-step Standard Classification of Occupations according to parental occupational and educational level (CBS, 2001). The effect of sex was tested by including two-way interactions of sex G1 by G1 behavior, and sex G2 by G1 behavior to the models. Z-scores were used in the analyses for all variables, except for sex G1 and sex G2. In the results section we will refer to the parameter estimates using the abbreviation 'est.'

To test for the specificity of the syndrome transmission, cross-syndrome correlations were modeled. Each multilevel analysis was repeated seven times by including the G1 scale that matches the G2 outcome scale and one of the other seven syndrome scales. In this way we were able to test if the G1 scale predicted the matching G2 scale more strongly than the other scales did.

Results

Impact of G1 behavior on G2 behavior

Table 2.2 shows the models for predicting G2 behavior on the basis of the similar G1 behavior. All G1 problem behavior scales significantly predicted similar G2 scales, except the Thought Problems scale.

Table 2.2 G1 childhood behavior as a predictor of similar G2 behavior, results of the multilevel analyses (N G1= 271, N G2=424).

Type of G1 and G2 behavior	Estimate	95% CI
Anxious/Depressed	.18**	.07-.28
Withdrawn	.14**	.04-.24
Somatic Complaints	.12*	.02-.22
Social Problems	.14**	.04-.24
Thought Problems	.06	-.03-.16
Attention Problems	.11*	.00-.21
Delinquent Behavior	.16**	.06-.25
Aggressive Behavior	.11*	.01-.22
Externalizing	.12*	.02-.23
Internalizing	.19**	.07-.29.
Total Problems	.20**	.10-.31

* p<.05, **p<.01 sex G1, sex G2, SES, age G1 and age G2 were used as covariates in the analyses.

We also studied whether the effect of G1 childhood behavior on G2 behavior was modified by the sex of the G1 parent and the G2 child by testing the interactions between sex and G1 child behavior. Significant sex differences were found for the transmission of Delinquent Behavior. First, when the G1 parent was female, Delinquent Behavior was a stronger predictor for Delinquent Behavior in the G2 child, than when the G1 parent was male (male est.= -.03, female est.=. 33). Second, the transmission of Delinquent Behavior from G1 to G2 was stronger for G2 boys than for G2 girls (boys est.=. 28, girls est. =-. 02).

A significant interaction was found between G1 sex and Total Problems (male est.= .04, female est.=.31) indicating that the intergenerational transmission of behavior by males was less strong than the transmission by females.

Finally, cross-syndrome correlations were modeled to test the specificity of the transmission (results not shown). Thought Problems was not tested with cross-syndrome correlations because intergenerational transmission was not present for this scale. The transmission of three scales was very specific: Anxious/Depressed, Somatic Complaints and Delinquency were better predicted by their G1 counterpart than by any other scale. The other four scales Withdrawn, Social Problems, Attention Problems and Aggressive Behavior were moderately specific. Three out of the other seven scales were better predictors of G2 Withdrawn than the G1 Withdrawn scale; only one out of the other seven scales was a better predictor of G2 Social Problems than G1 Social Problems; two out of the other seven scales were better predictors of G2 Attention Problems than G1 Attention Problems; and only one out of the other seven scales was a better predictor of G2 Aggressive Behavior than G1 Aggressive Behavior.

Discussion

In the present study we investigated the intergenerational transmission of child problem behavior from parents to their children. Eight specific syndrome scales, reflecting different types of behaviors, were assessed with the CBCL in the G1 sample of 1983 and these behaviors were compared to the same behaviors assessed with the CBCL in G2 children in 2007. Because of the broad spectrum of problem behaviors assessed, we were able to compare problem behaviors and the extent to which they were transmitted to the next generation. For both measurements, parental reports were used. Because of the size and composition of the sample, we were able to test sex differences in intergenerational transmission as well.

Our results show the presence of intergenerational continuities for a broad range of problem behaviors. They indicate that scores of the G1 parent in childhood predict scores of the G2 child on all broad-band scales and subscales except Thought Problems. Apart from the results for Thought Problems there were no indications that problem behaviors differed in the extent to which they were transmitted to the next generation. The transmission of the problem behaviors was very to moderately specific, which strengthens the argument

that these problem behaviors to some extent breed true. Sex differences were found for Delinquent Behavior: transmission of Delinquent Behavior is stronger when the G1 parent is a mother, and when the G2 child is a boy. Furthermore, intergenerational transmission of Total Problems is stronger for G1 mothers than for G1 fathers.

Our results are partly in line with the results of other studies that investigated intergenerational transmission of child behavior. With regard to internalizing problems, our results resemble the results of the study of Cohen et al. (Cohen et al., 1998), who found intergenerational continuity in inhibited behavior. To our knowledge, the study of Cohen et al. was the only study that has investigated intergenerational transmission of child internalizing problems. With regard to externalizing behavior, the results of the present study differ from the studies of Cairns (Cairns et al., 1998) and Smith et al. (Smith & Farrington, 2004) in which no intergenerational continuity was found for externalizing behavior. Our results may differ from the study of Cairns because of our sample size, which is about four times as large as the sample size of the Cairns study. The lack of results for intergenerational continuity in child behavior in the study of Smith et al. may have been caused by their use of differing measures of parent and child behaviors. On the other hand, the results of the present study did resemble the results of the studies of Kaplan (Kaplan & Liu, 1999)and Thornberry et al.(Thornberry et al., 2003) in which continuities in childhood externalizing behavior were found, and the results of the study of Serbin et al.(Serbin et al., 1998) in which the intergenerational transmission of child aggressive behavior was nearly significant. However, these studies focused on externalizing behavior and were therefore not able to compare a broad range of behaviors, as we were in the present study.

Delinquent Behavior was the only subscale for which sex differences were found. First, the transmission of Delinquent Behavior was stronger in mothers than in fathers. Several studies highlight the importance of negative parenting and adverse family environment for children at increased genetic risk for developing antisocial behavior (Rutter, Moffitt, & Caspi, 2006; Thapar, Harold, Rice, Langley, & O'Donovan, 2007). Previous studies have tested the effect of the presence and absence of fathers in the home on child behavior (Blazei et al., 2008; Jaffee, Moffitt, Caspi, & Taylor, 2003). In these studies, children of antisocial fathers were found to exhibit higher rates of externalizing behavior when the fathers were present in the home than when they were raised without their biological fathers. Although only paternal presence was tested in these studies, the strong environmental effect that was found for the transmission of antisocial behavior of fathers and their offspring may as well apply to mothers. Because women in the Netherlands usually spend more time with their children than fathers do, mothers play a more important role in creating the family environment, and they may therefore be more important in the development of antisocial behavior in their offspring. The main caretaker role of mothers may also be an explanation for the second sex difference that we found, that childhood Total Problems of mothers was a slightly better predictor for second-generation child behavior than the childhood behavior of fathers. Not

only the development of externalizing behaviors is influenced by environmental factors such as parenting, this is also found for other types of problem behavior and psychopathology, such as depression and ADHD (Rutter et al., 2006; Thapar et al., 2007).

With regard to the stronger intergenerational transmission of Delinquent Behavior in sons, apparently boys are more at risk to develop delinquent behavior. Poor parenting may be one mechanism through which the intergenerational transmission of behavior takes place. There are indications that interaction of genotype and parenting behavior predict the development of antisocial behavior (Feinberg et al., 2007). Furthermore, a study of D'Onofrio et al.(D'Onofrio et al., 2007) showed that intergenerational transmission of conduct disorder is largely environmentally mediated for boys, but not for girls, which would explain the sex difference present in our study.

Only a few other studies have looked at sex differences in intergenerational transmission. The studies of Cohen et al. (Cohen et al., 1998) and Smith & Farrington (Smith & Farrington, 2004) did not find any sex differences. As in the study of Cohen, the present study did not find any sex differences in internalizing problems. Perhaps inconsistency in the results between the study of Smith and the present study may again be due to differing measures of parent and child behaviors in the study of Smith. Finally, the study of Thornberry (Thornberry et al., 2003) found a direct intergenerational transmission of child antisocial behavior in males, but not in females. However, results were only shown after the covariate parenting was included in their analyses and therefore a proper comparison with the present study cannot be made.

Taking into account that we assessed problem behavior in two generations, with a time difference of 24 years and rated by different informants, the associations between child behavior of parents and their offspring are remarkable. We will therefore describe a mechanism that may underlie the development of these intergenerational continuities. Of course, genetic effects are present that can influence the intergenerational transmission of child behavior in several ways. Specific genes that generate vulnerability for developing certain problem behavior can be directly transmitted from parent to child and gene-environment interplay may serve as an additional risk factor for intergenerational transmission of behavior. From other studies we know that childhood behavioral problems often are chronic and evolve into adulthood (Caspi et al., 2003; Caspi et al., 1996; Hofstra et al., 2000; Kim-Cohen et al., 2003). When these adults become parents, they are more likely to create a risk environment for their children, due to their own current problem behavior that originated in childhood. The genetic vulnerability that the children may have inherited from their parents interacts with the non-optimal environment that their parents provide, which may trigger the development of problem behavior in the children. This is one way in which genetic and environmental factors contribute to the intergenerational transmission of behavior. Pathways like this are supported by the results of a few longitudinal studies (Kaplan & Liu, 1999; Smith & Farrington, 2004; Thornberry et al., 2003).

However, the results of longitudinal studies that prospectively follow child problem behaviors in their development show that this mechanism may not explain the intergenerational continuities fully. In these studies continuities in behavior have been found over large time spans, but discontinuities have been found as well: in the 14-year follow-up of the Zuid-Holland Study, Hofstra et al. found that of the 4 to 16-year-old children who were initially classified as deviant, 41% were classified as deviant 14 years later (Hofstra et al., 2000). This means that 59% of the children initially classified as deviant were classified in the normal range at follow-up. Data from the Dunedin study showed that under-controlled and inhibited 3-year-olds differed significantly from the comparison group on psychiatric disorders at age 21 (Caspi et al., 1996). However, effect sizes were small, which implies that not all under-controlled and inhibited toddlers met diagnostic criteria when they grew up. Summarizing, not all children exhibiting problem behavior grow up to be poorly adjusted parents. Despite this discontinuity, in the present study we still found clear continuities in the child behavior of parents and their offspring 24 years later.

Another pathway could be for a child to inherit a trajectory of problem behavior from its parent. In recent years, several studies have investigated the development of behavior longitudinally (Broidy et al., 2003; Dekker et al., 2007; Sterba et al., 2007). The results of these studies have shown that within a population, subgroups of individuals exist that follow different developmental courses of problem behavior during their lives. For antisocial behavior for example, the existence of the following subgroups was shown in the longitudinal Dunedin study (Odgers et al., 2008): a group of individuals that are chronically low on antisocial behavior, a group of individuals that are chronically high on antisocial behavior, a group of individuals that start to develop antisocial behavior during adolescence, and a group of individuals that is high on antisocial behavior during childhood but reaches low levels of antisocial behavior at the end of adolescence. However, to investigate whether trajectories are transmitted from parent to child, both parents and their offspring will have to be followed in their development through their childhood. Such a study would take several decades and would therefore be difficult to accomplish.

Some limitations of the current study should be mentioned. First, this study only relied on parental ratings of child behavior. It would have been a valuable addition to compare teacher reports or self-reports of the G1 and G2 generation. Although all informants were parents, these informants were different individuals across generations. The behavior of the G2 children is rated by G1 participants, and the behavior of G1 children is rated by their parents, i.e. the grandparents of the G2 children. A second limitation of this study is that has information on the child behavior of only one parent available, while childhood behavior of the other parent is equally important. A third limitation is the measurement of behavioral reports by the use of only one source of information. The use of multiple informants and instruments would have given a more complete picture of the transmission of child problem behavior. Finally, mechanisms behind this intergenerational transmission of behavior cannot be derived from

these analyses. Factors that are possibly important in the transmission of behavior, such as parenting, parental psychological problems, genetic factors or a combination of the latter with the former two, have not been taken into account in this study. Therefore, the present study can only describe but not explain intergenerational transmission of psychopathology.

Despite these limitations, the present study has some particularly strong features. First, prospective information on children in two generations was collected on a broad range of child problem behaviors. Only a few studies have prospectively shown that there are continuities in the behavior of parents in childhood and their children and these studies are limited to only one or two types of problem behavior (Cohen et al., 1998; Kaplan & Liu, 1999; Serbin et al., 1998; Thornberry et al., 2003) and were therefore not able to compare the intergenerational continuity of different behaviors as the present study did. A second advantage is the nature of the sample that was used. Many studies have focused only on high-risk groups (Cairns et al., 1998; Cohen et al., 1998; Serbin et al., 1998; Thornberry et al., 2003), whereas the present study investigated a representative general population sample. It is important to explore both, as results may differ across samples. In high-risk samples the effects of pathological, extreme behaviors are investigated, but high-risk studies are not necessarily suitable for drawing conclusions about the naturally occurring range of problem behaviors. Third, we were able to use a relatively large sample for our analyses; earlier longitudinal studies had sample sizes of 100 parent-child pairs or fewer. Finally, 24 years after the initial measurement of G1 participants, the same instrument was used to measure the behavior of their G2 children, which is preferable over the use of different instruments.

In this prospective study on the intergenerational transmission of child behavior, we found intergenerational continuities in a broad range of problem behaviors. Except for thought problems, no differences were found across problem behaviors regarding the extent to which they are transmitted to the next generation. Some sex differences were found; mothers were more likely than fathers to transmit delinquent behavior and problem behavior in general as indexed by the Total Problems scale to their children, and delinquent behavior was also more likely to be transmitted to boys than to girls. These results show that childhood problems indeed form a risk factor for the next generation. However, through which mechanisms childhood problems get transmitted to the next generation was not the subject of this study. It will be a challenge for future research to find ways to prevent problem behavior from being transmitted across generations, and for that purpose it will be necessary to gain insight into the specific mechanisms that underlie such transmission.

Chapter 3

The role of parental psychopathology and parenting in the intergenerational transmission of child problem behavior

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Abstract

Background: It is important to provide insight into the etiology of intergenerational transmission of child internalizing and externalizing problems. In this study current parental problem behavior and parenting are investigated as possible factors to explain this transmission

Methods: In a longitudinal population-based study (N parents=279, N offspring=424) Structural Equation Modeling was used to investigate the relationship between parental childhood problem behavior, current parental problem behavior, parenting and offspring problem behavior.

Results: Current parental problem behavior mediated the relationship between two generations of child internalizing and externalizing problems fully. Parenting did not mediate the relationship between problem behavior of the parent in childhood and offspring internalizing and externalizing problems. However, parenting mediated the relationship between current parental psychopathology and offspring internalizing and externalizing problems in part.

Conclusions: Only current parental problem behavior explains the associations between two generations of child problem behavior, but current parental problem behavior and parenting both predict child problem behavior. Future studies should take both factors into account as separate risk factors.

Introduction

In the last decennium, several longitudinal studies investigated intergenerational continuities in child problem behavior. In a study of Cohen and colleagues (Cohen et al., 1998) inhibited child behavior in parents was associated with inhibited behavior of their offspring 19 years later. Serbin et al. (Serbin et al., 1998) found associations between the level of aggression in girls and the levels of aggression and responsiveness in their offspring after 18 years. These studies, however, do not provide insight into the mechanisms of intergenerational continuities. In this paper, we will focus on two factors that may be involved the intergenerational transmission of problem behavior: parenting and parental current psychopathology. These factors have been investigated extensively in cross-sectional research, and there is evidence for associations of both factors with child problem behavior (Burt et al., 2005; Decaluwe, Braet, Moens, & Van Vlierberghe, 2006; Elgar, Mills, McGrath, Waschbusch, & Brownridge, 2007; Frye & Garber, 2005; Johnson et al., 2001; Trentacosta & Shaw, 2008).

The role of parenting has also been addressed in a few longitudinal studies on intergenerational continuity of child problem behavior. Thornberry and colleagues (Thornberry et al., 2003) found that aggressive parenting of mothers who were antisocial in adolescence influenced the development of antisocial behavior in their children. Conger and colleagues (Conger et al., 2003) found that parenting explained the transmission of childhood angry and aggressive behavior. Findings of the Smith & Farrington study showed that authoritarian parenting was related to conduct problems in two successive generations (Smith & Farrington, 2004). Up to now it has not been investigated if parenting also plays a role in the intergenerational continuity of internalizing problems.

Compared to parenting, the effect of parental current psychopathology has hardly been investigated in longitudinal studies on intergenerational transmission of behavior. This is remarkable because parental psychological well-being is suggested to influence parenting (Belsky, 1984; Leinonen et al., 2003; Trentacosta & Shaw, 2008). By overlooking parental current psychopathology, the role of parenting in the intergenerational transmission of child problem behavior might be inflated. Because of the association between parenting and current parental psychopathology, the effect of psychopathology may be attributed to parenting when current parental psychopathology is not taken into account. Therefore, the effect of current parental psychopathology and parenting on the intergenerational transmission of problem behavior should be tested simultaneously.

To our knowledge, only one prospective study investigated the effect of current parental psychopathology and parenting simultaneously as explanatory factors in intergenerational transmission of child problem behavior. The results of this study on intergenerational transmission of female externalizing behavior indicate that (Kaplan & Liu, 1999) externalizing behavior continued through psychological dysfunction of the mothers. Psychological dysfunction of the mothers was measured by maternal vulnerability, anxiety and depression.

When both parenting and current psychological dysfunction of the mother were taken into account, only current psychological dysfunction of the mother predicted externalizing behavior of the daughters significantly. However, this study only addressed externalizing behavior in adolescent females.

In the present longitudinal, population-based study we investigated whether current parental problem behavior and parenting explain intergenerational continuity of child problem behavior by testing if current parental problem behavior and parenting functioned as mediators in the relationship between parental childhood problem behavior and offspring behavior. In addition, we investigated whether both factors had a unique effect on child problem behavior by testing if parenting functioned as a mediator in the relationship between current parental problem behavior and offspring problem behavior. Pathways for both externalizing and internalizing problems were analyzed.

Methods

Population and procedure

In this study we used data from the 1st and 7th wave of the Zuid-Holland study, a longitudinal population-based study that started in 1983. A random sample of 2600 children and adolescents from 4 to 16 years of age was drawn from municipal registers of the Dutch province of Zuid-Holland which encompasses both urban and rural areas. Parents were asked to fill in a CBCL questionnaire on the behavior of their child. Of the 2447 parents reached, 2076 (84.8%) provided usable information about their children. After the first measurement in 1983 (time 1), the sample was approached again in 1985 (time 2), 1987 (time 3), 1989 (time 4), 1991 (time 5), 1997 (time 6) and 2006 (time 7). For details on the initial data collection, see Verhulst (Verhulst, Akkerhuis et al., 1985).

For the seventh measurement, all participants, now aged 27 to 39, were contacted between January 2006 and July 2007, except for 23 who had deceased, 10 who were intellectually disabled and 264 who could not be traced. Usable information was provided by 1365 participants (66%). We used logistic regression to investigate if demographic characteristics were associated with participation at time 7. Participants at time 7 were more likely to be female (of all participants at T1, 70% of the females and 62% of the males participated at T7; OR: 1.39, $p<.01$), younger (mean age at baseline was 10.2 years for non-participants and 9.8 years for participants; OR: .96, $p<.01$), and to have had a higher SES at T1 (3.4 for non-participants and 3.7 for participants on a scale from 1 to 6 with 1 being a low SES; OR: 1.13, $p<.01$). They also had a lower score on Externalizing behavior at the first measurement than non-participants (participants 7.2 and non-participants 8.3, OR: .98, $p<.05$). In addition to providing information about their own behavior, all participants with children of 18 months or older were requested to fill in a questionnaire on their children's behavior, and on their parenting. In this

text, the first generation participants are referred to as 'G1' (Generation 1) and their children as 'G2' (Generation 2).

Of the 1365 G1 participants in the 7th wave of the Zuid-Holland Study, 775 (57%) had a total of 1407 children. Participants with children were compared to participants without children by using logistic regression. Participants with children tended to be older (mean age at baseline was 11.4 for participants with children and 8.8 for participants without children, OR: 1.24, p<.01), female (of all participants 48% of the females and 31% of the males have children, OR: 2.30, p<.01) and to have a lower SES (3.4 for participants with children and 3.8 for participants without children, OR:. 83, p<.01) than participants without children. Fourteen G1 participants did not want to involve their children in the study, and 137 G1 participants did not return the questionnaires about their children.

Depending on the age of the offspring the CBCL/1.5-5 or the CBCL/6-18 was used. In this study we only included offspring for whom the CBCL/6-18 was available, because this information was best comparable to the available information on parental childhood problem behavior. A total of 279 G1 participants filled in usable questionnaires on 424 G2 children aged 6 years and older (mean age: 9.2 years). The mean age of the G1 participants at first measurement was 12.8 years. Of the G1 participants, 188 were female and 91 participants were male. The G2 sample consisted of 215 boys and 209 girls.

Informed consent has been appropriately obtained from all adult participants in all assessment waves.

Instruments

Child Behavior Checklist

The CBCL (Achenbach & Rescorla, 2001b) is a questionnaire designed to assess behavioral and emotional problems in children. The questionnaire is completed by parents and can be scored on two broad-band groupings of syndromes; Internalizing and Externalizing Behavior. Good reliability and validity of the CBCL have been replicated for the Dutch translation (Verhulst et al., 1996).

For the first measurement in 1983, the CBCL /4-16 was used. Because the CBCL was revised in 2001, we used the adapted CBCL in the 7th wave. This new version of the CBCL differs slightly from the 1983 version(Achenbach & Rescorla, 2001b).

EMBU-P

The EMBU-P (Markus, 2003) is a diversion of the original EMBU and has been developed as a self-report for parents' current parenting towards their own children.

The EMBU measures parenting on four scales: Rejection, Overprotection, Emotional Warmth and Favouring Subject. Principal Component Analysis (Markus, 2003) confirmed these four factors in the EMBU-P. Reliability analyses revealed that the alpha coefficients for

Emotional Warmth (α= .80) and Rejection (α=. 88) scales were high.The alpha coefficient for the Overprotection (α=. 70) and Favoring (α=.63) scale, can be described as being moderate, which is in line with previous research on the EMBU.

For this study we used the factors Rejection (22 items), Overprotection (11 items) and Emotional Warmth (15 items), which was reported by G1 mothers and fathers about each of their children separately. We omitted the factor Favoring because this factor assesses if a parent favors one child over another, and not all parents had more than 1 child. Each item was rated on a 4-point scale from 1 (no, never) to 4 (yes, almost always). The items on the Rejection scale measure hostility, punishment and blaming of the child. The Overprotection scale measures parents' anxiousness for the child's safety, and their intrusive and guilt arousing behavior towards the child. The Emotional Warmth scale refers to parents' supportive and affectionate behavior towards their child.

Adult self-report.

The ASR (Achenbach & Rescorla, 2003) is a self-report rating scale for assessing emotional and behavioral problems for ages 18 to 59 years, that is modeled after the CBCL. The ASR is a self-report questionnaire that can be scored on eight syndrome scales and two broad-band groupings of syndromes: Internalizing, which consists of the Anxious/Depressed, Withdrawn and Somatic Complaints scales and Externalizing, which consists of the Intrusive Behavior, Rule-Breaking Behavior and Aggressive Behavior scales. Good reliability and validity have been reported for the ASR (Achenbach & Rescorla, 2003).

Demographic factors

The following demographic factors were included in the analyses: sex and age of G1 participants, sex and age of G2 participants and G1 current SES. SES was scored on a five-step Standard Classification of Occupations according to parental occupational and educational level (CBS, 2001)**.**

Statistical analyses

We conceptualized our models of intergenerational transmission of behavior in a set of structural equation models using Mplus (Muthén & Muthén, 1998-2007). We used methods for complex sampling that account for multiple observations within clusters, because 34% of the parents had two or more participating children.

To come to our final model, three mediational models were investigated. Separate analyses were done for Internalizing and Externalizing Behavior. Sex G1, sex G2, age G1, age G2 and G1 SES were used as covariates in each analysis.

Testing the mediational models

Each mediational effect was tested by examining three models. We tested a direct model, in which the predictor predicts the outcome variable; a mediated model, in which the predictor predicts the mediator, and the mediator predicts the outcome variable; and a full model in which the predictor and the mediator both predict the outcome variable. Our theoretical model is shown in Figure 3.1.

Our first aim was to investigate if parental current problem behavior fully explained the relation between parental childhood problem behavior and offspring problem behavior. To answer this question, we first tested if a significant association existed between parental childhood problem behavior and offspring problem behavior (path a). This was our direct model. For the mediated model, we tested if there was a significant association between parental childhood problem behavior and parental current problem behavior (path b), and a significant association between parental current problem behavior and offspring problem behavior (path c). In this model, the path from parental childhood problem behavior to offspring problem behavior (path a) was constrained to zero. Finally, we created a full model in which parental childhood problem behavior and parental current problem behavior both predicted offspring problem behavior (path a+b+c). To determine the existence of mediational relations we compared the significance and effect size of the direct and mediational paths in the three conducted models. Sobel tests (Sobel, 1982) were used to investigate the significance of the mediation effect.

Our second aim was to test whether parenting mediated the relationship between parental childhood problem behavior and offspring problem with a similar procedure. For these analyses we used paths a, d and f.

Figure 3.1 Model of intergenerational transmission of child problem behavior

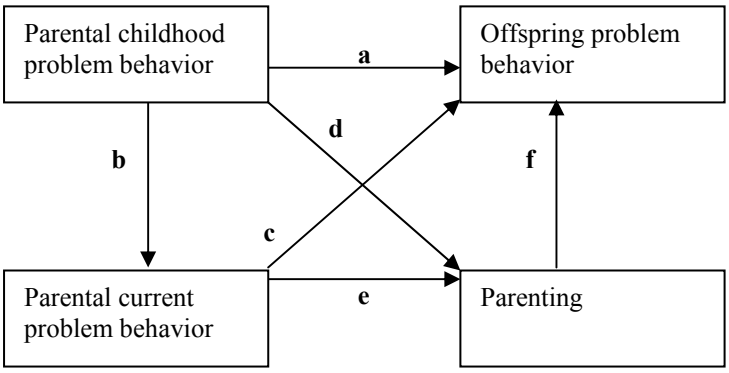


Table 3.1 Correlations between scales

	Parental Externalizing child Behavior	Parental Internalizing child Behavior	Parental current Externalizing Behavior	Parental current Internalizing Behavior	Offspring Externalizing Behavior	Offspring Internalizing Behavior	Rejection	Overprotection	Emotional Warmth
Parental Externalizing child Behavior	1.00								
Parental Internalizing child Behavior	.44**	1.00							
Parental current Externalizing Behavior	.27**	.15**	1.00						
Parental current Internalizing Behavior	.19**	.29**	.65**	1.00					
Offspring Externalizing Behavior	.18**	.17**	.31**	.40**	1.00				
Offspring Internalizing Behavior	.18**	.19**	.36**	.48**	.57**	1.00			
Rejection	.11*	.05	.31**	.32**	.58**	.35**	1.00		
Overprotection	.05	.11*	.23**	.35**	.28**	.26**	.34**	1.00	
Emotional Wamth	-.02	.03	-.01	-.05	-.19**	-.10*	-.24**	.03	1.00

*p<.05, **p<.01

Our third aim was to test whether parenting mediated the relationship between parental current problem behavior and offspring problem behavior, using a similar procedure. For these analyses we used paths c, e and f.

Results

Table 3.1 shows the correlations between the variables. Parental childhood problem behaviors were correlated with parental current problem behaviors and offspring problem behaviors. A weaker correlation was found between parental childhood Externalizing Behavior and Rejection, and between parental childhood Internalizing behavior and Overprotection. Parental current problem behaviors were correlated with offspring problem behaviors, Rejection and Overprotection. Rejection, Emotional Warmth and Overprotection were correlated with offspring problem behaviors.

Does parental current problem behavior mediate the relationship between parental childhood problem behavior and offspring problem behavior?

The results of the mediation analyses for the associations between parental childhood problem behavior, parental current problem behavior and offspring problem behavior are shown in Table 3.2. With regard to Externalizing Behavior, in the direct model there was a significant relationship between parental childhood Externalizing Behavior and offspring Externalizing Behavior. In the mediated model, the relation between parental childhood Externalizing Behavior and current parental Externalizing Behavior was significant. The relation between current parental Externalizing Behavior and offspring Externalizing Behavior was significant as well. In the full model, the mediated path was still significant, whereas the direct regression path between parental childhood problem behavior and offspring Externalizing Behavior had decreased by 42% compared to the direct model, and was not significant anymore. The sobel test showed that this was indeed a significant mediation (Sobel test: 2.90, $p<.01$). The relation between parental childhood Externalizing Behavior and offspring Externalizing Behavior was therefore fully mediated by current parental Externalizing Behavior.

With regard to Internalizing Problems similar results were found. In the direct model there was a significant regression path between parental childhood Internalizing Problems and offspring Internalizing Problems. The paths in the mediated model; from parental childhood Internalizing Problems to current parental Internalizing Problems and from current parental Internalizing Problems to offspring Internalizing Problems were significant as well. In the full model, the relation between parental childhood Internalizing Problems and offspring Internalizing Problems was fully mediated by current parental Internalizing Problems; the path from parental childhood Internalizing Problems to offspring Internalizing Problems had

Table 3.2 Direct, mediated and full models predicting offspring Internalizing and Externalizing Behavior from parental childhood Internalizing and Externalizing Behavior and parental current Internalizing and Externalizing Behavior (N parents=279/N offspring=424).

	Models predicting offspring Externalizing Behavior from parental Externalizing behavior						Models predicting offspring Internalizing Problems from parental Internalizing Problems					
	Direct		Mediated		Full		Direct		Mediated		Full	
Path	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE
Parental childhood problem behavior to offspring problem behavior	.187*	.080			.108	.074	.197*	.079			.063	.068
Parental childhood problem behavior to current parental problem behavior			.249**	.066	.249**	.066			.387**	.107	.386**	.107
Current parental problem behavior to offspring problem behavior			.360**	.076	.331**	.073			.351**	.043	.339**	.045

*p<.05, **p<.01

decreased by 68% compared to the direct model and was not significant anymore (Sobel test: 3.25, p<.01).

Does parenting mediate the relationship between parental childhood problem behavior and offspring problem behavior?

Mediation can only occur when there is a significant relation between the predictor and the mediator. We did not find a significant relation between parental childhood problem behavior and the parenting dimensions Rejection, Emotional Warmth and Overprotection (results not shown). This means there was no mediational effect of parenting in the relationship between parental childhood behavior and offspring behavior. This pathway was therefore not included in the final model.

Does parenting mediate the relationship between parental current behavior and offspring problem behavior?

The results of the mediation analyses for the relation between parental current behavior, parenting and offspring problem behavior are shown in Table 3.3. The parenting dimension Emotional Warmth was not predicted by current parental problem behavior, and it did not predict offspring problem behavior. Emotional Warmth was therefore excluded from our final models.

In the direct model, the regression path from current parental Externalizing Behavior to offspring Externalizing Behavior was significant. In the mediated model, the paths from current parental Externalizing Behavior to Rejection and Overprotection were significant. The paths from Rejection and Overprotection to offspring Externalizing Behavior were significant as well. In our full model, the direct path from parental current Externalizing Behavior to offspring Externalizing Behavior had decreased by 59% compared to the direct model, but was still significant. Rejection and Overprotection both predicted offspring Externalizing Behavior. The Sobel tests for both mediators were significant (Sobel test Rejection: 4.56, p<.01; Sobel test Overprotection: 1.68, p<.05). This means that parenting mediated the relation between current parental Externalizing Behavior and offspring Externalizing Behavior in part.

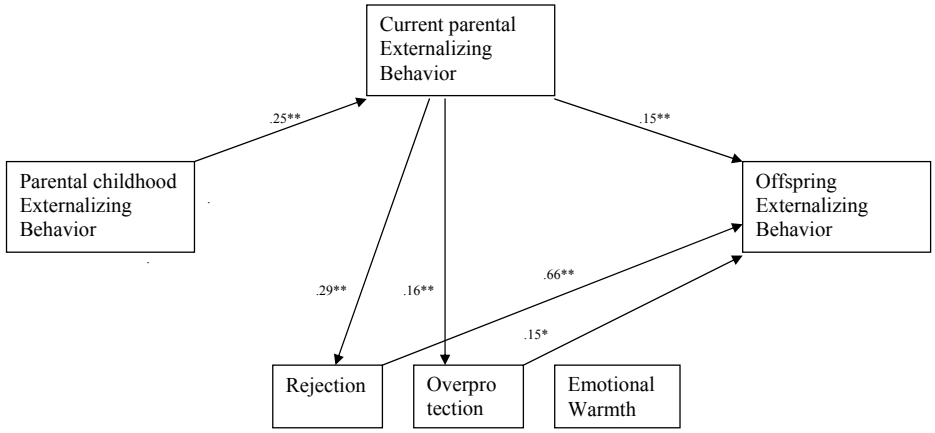
The mediation analyses for Internalizing Problems showed approximately the same results. In the direct model, parental current Internalizing Problems predicted offspring Internalizing Problems significantly. The regression paths in the mediated model from current Internalizing Problems to Rejection and Overprotection, and from Rejection and Overprotection to offspring Internalizing Problems were significant as well. In the full model, the path from parental current Internalizing Problems to offspring Internalizing Problems had decreased by 33% compared to the direct model, but was still significant. Rejection predicted offspring Internalizing Problems, but the relation between Overprotection and offspring Internalizing Problems failed to reach significance in the full model. The Sobel test statistics for both mediators were significant (Sobel test Rejection: 3.27, p<.01; Sobel test Overprotection: 1.77,

Table 3.3 Direct, mediated and full models predicting offspring Externalizing and Internalizing problem behavior from parental current Externalizing and Internalizing Behavior and parenting (N parents=279/N offspring=424).

	Models predicting offspring Externalizing Behavior from parental Externalizing Behavior						Models predicting offspring Internalizing Problems from parental Internalizing Problems					
	Direct		Mediated		Full		Direct		Mediated		Full	
Path	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE
Current parental problem behavior to offspring problem behavior	.360**	.076			.146*	.068	.351**	.043			.272**	.042
Current parental problem behavior to Rejection			.292**	.057	.291**	.057			.197**	.041	.195**	.042
Current parental problem behavior to parental Overprotection			.159**	.049	.158**	.049			.160**	.022	.158**	.022
Rejection to offspring problem behavior			.700**	.063	.660**	.065			.378**	.064	.276**	.060
Overprotection to offspring problem behavior			.176*	.079	.148*	.075			.313**	.087	.146	.080

*p<.05, **p<.01

Figure 3.2 Structural equation model of the intergenerational transmission of child Externalizing Behavior (N parents=279, N offspring=424).



**p<.05, **p<.01 χ^2=32.026, CFI=.94, RMSEA=.046*

p<.05). From these results we may conclude that parenting is a partial mediator in the relation between current parental Internalizing Problems and offspring Internalizing Problems.

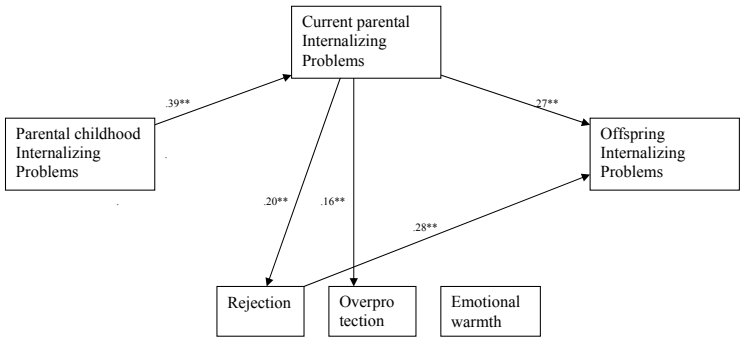
Predicting offspring Externalizing Behavior

The final model for the transmission of child Externalizing Behavior is shown in Figure 3.2. The overall fit of the model is sufficient, with a CFI of .94 and an RMSEA of .046. Parental childhood Externalizing Behavior predicted current parental Externalizing Behavior. Current parental Externalizing Behavior predicted parental Rejection and Overprotection significantly. Current parental Externalizing Behavior, Rejection and Overprotection predicted offspring Externalizing problem behavior.

Predicting offspring Internalizing Problems

Figure 3.3 shows the final model for the intergenerational transmission of child Internalizing Problems. Parental childhood Internalizing Problems predicted current parental Internalizing Problems. Current parental Internalizing Problems significantly predicted parental Rejection and Overprotection. Current parental Internalizing Problems and Rejection predicted offspring Internalizing problem behavior. The model has a sufficient fit (CFI=.97, RMSEA=.034).

Figure 3.3 Structural equation model of the intergenerational transmission of child Internalizing Problems (N parents =279, N offspring=424).



**p<.05, **p<.01 χ^2=25.457, CFI=.97, RMSEA=.034*

Discussion

In this longitudinal study, we investigated whether current parental internalizing and externalizing behavior and parenting are explanatory factors in the association between parental childhood problem behavior and the child problem behavior of their offspring 24 years later. In summary, current parental problem behavior played a substantial role in the transmission of child internalizing and externalizing behavior across generations, but parenting did not. However, the effect of current parental problem behavior on offspring problem behavior was partly mediated by parenting.

In our study, current parental psychopathology was an explaining factor in the intergenerational transmission of child behavior. We found that parental childhood problem behavior was associated with current parental problem behavior. Current parental problem behavior in its turn was associated with offspring problem behavior. The mediational effect of current parental problem behavior in the intergenerational transmission of child problem behavior was also found in the study of Kaplan and Liu (1999).

Interestingly, parenting did not explain the intergenerational transmission of child problem behavior directly. This result deviates from the results of several intergenerational studies in which parenting was found to be an independent explanatory factor (Conger et al., 2003; Hops, Davis, Leve, & Sheeber, 2003). However, the previous studies did not take current parental problem behavior into account, which, as became clear in our present study, is a major factor of influence. It is not surprising that parenting was found to have an effect on offspring problem behavior in the previous studies. Our study results indicate that parenting mediates the relation between parental current psychopathology and offspring problem behavior in part. It therefore contributes indirectly to the intergenerational transmission of child problem behavior. This result is in line with the theory that parenting is influenced by parental psychopathology (Belsky, 1984).

The similarities between the intergenerational transmission of child internalizing and externalizing behavior are striking. The mechanisms behind the transmission of both dimensions are similar: current parental problem behavior mediates the intergenerational transmission of child behavior, it predicts parenting, and current parental problem behavior and parenting both have a unique effect on offspring problem behavior. Even the types of parenting that predict internalizing and externalizing behavior are comparable. For both, rejection is the most important predictor, and emotional warmth is the weakest. It is well known that parental rejection is associated with the development of offspring externalizing behavior.(Shaw, Bell, & Gilliom, 2000; Thornberry et al., 2003). Studies that investigate the effects of parenting on internalizing behavior have mixed results. Previous research found that overprotection was a prominent predictor of child internalizing problems (Bögels & van Melick, 2004; Muris, Meesters, & von Brakel, 2003). However, there is also evidence that rejection may even be a more important risk factor in the development of internalizing behavior (Hudson & Rapee, 2001; Moore, Whaley, & Sigman, 2004), which is in line with the results of the present study.

Emotional warmth is the only parenting style that was not predicted by parental current level of internalizing or externalizing behavior. Apparently, other factors than the level of current parental problem behavior are connected to emotional warmth in parents. The results of previous studies on transmission of parenting indicate that social learning-theory related mechanisms were at least partly responsible for the positive behaviors that parents displayed towards their children (Belsky, Jaffee, Sligo, Woodward, & Silva, 2005; Chen & Kaplan, 2001). Perhaps the parenting style of the parents of G1 individuals is a more important predictor of emotional warmth than current parental problem behavior. Also, emotional warmth did not predict offspring internalizing and externalizing behavior.This is in line with the results of previous studies (Brown & Whiteside, 2008; Gruner et al., 1999; Muris, Meesters, Merckelbach, & Hulsenbeck, 2000), in which the effect of emotional warmth on internalizing problems was less strong than the effects of rejection and overprotection.

Although we were not able to test for the shared genetic liability in parents and their children, genetic factors most probably play a role in the intergenerational transmission of child behavior. Previous studies have shown that a substantial part of the observed variance of behavior can be explained by genetic factors (Bartels et al., 2006; Bartels et al., 2004; Boomsma et al., 2005). Furthermore, it is plausible that our findings imply elements of gene-environment interplay. Genes are found to be involved in individual differences in the exposure to a wide range of environments, which is called gene-environment correlation (Rutter, 2007). In this case, the parental genes affect the parental behaviors that help shape the rearing environments that they provide for their children. The children inherit their parents' genes, and are therefore more likely to develop problem behavior to begin with. However, many genes will only come to expression when they are exposed to a non-optimal environment. Because the parents indeed provide their children with a non-optimal environment, the chance that

a child will actually inherit the parent's behavior increases. In this way, gene-environment interplay is likely to be involved in the intergenerational transmission of behavior.

Some limitations of the current study should be mentioned. First, only parental ratings were used for measuring child and parental behavior. Future studies should include multiple informants on child problem behavior in both generations. Second, parents have reported on their own parenting. Although our questionnaire is well validated, one may question the social desirability of the answers on a questionnaire like this (Morsbach & Prinz, 2006). Home observations of parent-child interactions may have made the parenting measurements more objective. Third, we must keep in mind that our finding that parental psychopathology explains child problem behavior over and beyond the parenting measure might reflect limitations of the measure of parenting. Although we have measured three core parenting dimensions that have been validated theoretically and empirically, they are not necessarily the only important parenting dimensions. Finally, because of the longitudinal study design and the use of only the individuals who have become parents, our sample has become small and select. Although our sample is relatively large for a two-generation, longitudinal study, we should be cautious in drawing conclusions about the general population. More research on the same topic and the use of larger samples is desirable.

Despite these limitations, the present study has some particularly strong features. The follow-up time of the study is 24 years. Similar instruments were used for assessing both generations, which makes comparisons between two generations justified. Finally, we compared models for both internalizing and externalizing behavior whereas previous studies only focused on externalizing behavior.

Conclusions

Our main finding is that current parental problem behavior serves as a mechanism by which child behavior problems are transmitted across generations. Although parenting was found to be a mechanism of transmission in previous studies, parenting was not directly associated with intergenerational transmission of child problem behavior in our study. However, parenting was associated with current parental problem behavior, and in this way it contributed to the intergenerational transmission of child problem behavior. We would therefore recommend future studies to consider current problem behavior and parenting as separate risk factors that should both be taken into account. As for clinical practice, the present study underlines the importance of taking the psychopathology of the parent into account when a child is referred. Because both current parental problem behavior and parenting influence the development of psychopathology in a child, and parenting behavior is influenced by current parental problem behavior, it may not be enough to just coach parents in developing constructive parenting behavior. Treating the psychopathology of the parent may influence the parenting behavior of the parent in a positive way. Furthermore, awareness of the parent's pathology may aid the therapist in finding more effective ways to coach parents in their parenting.

Chapter 4

The transmission of parenting and its role in the intergenerational transmission of externalizing behavior

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Submitted for publication

Abstract

Aims: to examine the role of two different parenting dimensions, rejection and overprotection, in the intergenerational transmission of externalizing behavior.

Methods: Data collected within a longitudinal community-based sample was used (N Generation2 = 279, N Generation3 = 424). With Structural Equation Modeling, models for intergenerational transmission of externalizing behavior were conducted. In particular, we examined if transmission of parental rejection and parental overprotection occurred, and whether the transmission took place directly or through Generation2 current externalizing behavior.

Results: Transmission of rejection and overprotection played a significant role in the development of externalizing behavior. Both dimensions predicted higher levels of offspring externalizing behavior in two generations. Rejection was transmitted through parental externalizing behavior. In contrast, overprotection was transmitted directly.

Conclusion: Different parenting dimensions may have different precursors and effects in the intergenerational transmission of externalizing behavior. It is important to be aware of this in research and in clinical settings.

Keywords: intergenerational transmission, longitudinal data, parenting, externalizing problems, population-based study.

Introduction

In developmental psychology, the intergenerational transmission of externalizing behavior and the mechanisms through which this transmission occurs have become major topics of attention. One of the most extensively investigated factors in this search for mechanisms is parenting. The role of parenting in the development of externalizing behavior is by now well established. Many studies have found that poor parenting practices are associated with externalizing problems in children (Belsky, Pasco Fearon, & Bell, 2007; Feinberg et al., 2007; Galambos, Barker, & Almeida, 2003; Shaw et al., 1998). Furthermore, there is an association between parental externalizing behavior and poor parenting (Johnson et al., 2001; McCord, 1999). Therefore, parenting is seen as a mechanism through which parental externalizing behavior is transmitted to offspring. Several studies have found evidence for this pathway (Conger et al., 2003; Thornberry et al., 2003).

However, researchers have suggested that parenting itself is transmitted across generations as well. A few studies have been conducted in which the intergenerational transmission of parenting was demonstrated. Some studies found that aggressive, hostile and inconsistent parenting is transmitted across generations (Pears & Capaldi, 2001; Smith & Farrington, 2004). Evidence for the transmission of constructive parenting was found as well (Belsky et al., 2005; Chen & Kaplan, 2001). Two main theories to explain the transmission of parenting have been posed. First, parenting may be transmitted directly, in line with the social learning perspective. In this case, children have learned parenting directly from their parents and adopt this same parenting behavior when they become parents themselves. Secondly, when parents exhibit poor parenting behavior, their children are more likely to develop externalizing problems. Individuals who develop externalizing behavior in childhood are more likely to continue this behavior in adulthood (Hofstra et al., 2000). These individuals are at risk to develop poor parenting when they become parents themselves, which makes that the cycle continues to repeat itself.

A few studies have investigated the role of intergenerational transmission of parenting in the intergenerational transmission of externalizing behavior. All of these studies found that the transmission of parenting played a role in the intergenerational transmission of externalizing behavior. However, the studies differed in their findings with regard to the pathways of parenting transmission. Some studies confirmed the existence of both the direct and the indirect transmission of parenting behavior. Capaldi et al. (Capaldi, Pears, Patterson, & Owen, 2003) found that direct and indirect transmission of parenting predicted the level of externalizing behavior in children, and Thornberry et al. (Thornberry et al., 2003) found a direct transmission of parenting to daughters and an indirect transmission of parenting through externalizing behavior problems to sons. Some studies however, only found one of the two pathways of parenting transmission. Hops et al. (Hops et al., 2003) found that the transmission of parenting was indirect,i.e. it was fully mediated by the aggressive behavior

of the parent. Conger et al. (Conger et al., 2003) however, found only a direct transmission of parenting.

Differences in the results of these studies may stem from differences in the methodology that was used (Dubow, Huesmann, & Boxer, 2003). Importantly, the construct of parenting was conceptualized in very different ways. In the Capaldi study (Capaldi et al., 2003), 'Parental Monitoring' was assessed by questions regarding tracking and supervision of the child's whereabouts. The 'Discipline' scale included disciplinary practices that were harsh, inconsistent or lax. These parenting behaviors together formed one variable for parenting. In the study of Conger et al., parenting was conceptualized as a latent factor formed by observer ratings of hostility, angry coercion and antisocial behavior. Affective ties and consistency of discipline were measured in the study of Thornberry et al. Again, a latent construct was formed. In the study of Hops, observers rated parental aggressive behavior by coding disapproving, threatening, argumentative statements accompanied by aversive affect. To summarize, these studies combine different parenting dimensions in their conceptualizations of parenting, which may lead to differences in the results. When investigating intergenerational transmission of externalizing behavior, it may therefore be important to look at different parenting dimensions separately.

The aims of the present study are threefold. First, we will examine the role of parenting in the intergenerational transmission of child externalizing behavior. We expect parenting to function as a mechanism through which child externalizing behavior is transmitted across generations. Second, we will examine whether parenting itself is transmitted across generations. We expect parenting to be transmitted directly, and indirectly through parental externalizing behavior. Third, we will focus on two separate parenting dimensions. We will use the dimension of rejection, that encompasses hostility, punishment and blaming; and the dimension of overprotection, that measures parents' excessive anxiousness for the safety of their child, and their intrusive and guilt arousing parenting. The existence of these dimensions has been well embedded in theory as well as in empirical studies (Baumrind, 2005; Hetherington, Henderson, & Reiss, 1999; O'Connor, Neiderhiser, Reiss, Hetherington, & Plomin, 1998). Both dimensions are found to be associated with offspring externalizing behavior (Kim, Hetherington, & Reiss, 1999; Reti et al., 2002; Trentacosta & Shaw, 2008). In this study, we will examine if they differ from each other in the way they are transmitted across generations, and in the roles they play in the intergenerational transmission of externalizing behavior.

We will use information that has been collected in a 10 year follow-up of a longitudinal community sample to investigate intergenerational pathways leading to externalizing behavior. To our knowledge, no previous study has examined the differences in the transmission of different parenting dimensions when examining intergenerational transmission of externalizing behavior.

Methods

Population and procedure

In this study we used data from the 6th and 7th wave of the Zuid-Holland study, a longitudinal population study that started in 1983. A random sample of 2600 children and adolescents from 4 to 16 years of age was drawn from municipal registers of the Dutch province of Zuid-Holland which encompasses both urban and rural areas. After the first measurement in 1983 (time 1), the sample was approached again in 1985 (time 2), 1987 (time 3), 1989 (time 4), 1991 (time 5) (Bongers, Koot, van der Ende, & Verhulst, 2004), 1997 (time 6) (Hofstra et al., 2000) and 2006 (time 7) (van Meurs, Reef, Verhulst, & Van der Ende, *In Press*). For details on the initial data collection, see Verhulst (Verhulst, Akkerhuis et al., 1985).

For the seventh measurement, all participants, now aged 27 to 40, were contacted between January 2006 and July 2007, except for 23 who had deceased, 10 who were intellectually disabled and 264 who could not be traced. Usable information was provided by 1365 participants (66%). We used logistic regression to investigate if demographic characteristics were associated with participation at time 7. Participants at time 7 were more likely to be female (of all participants at T1 70% of the females and 62% of the males participated at T7; OR:1.39, p<.01), younger (mean age at baseline was 10.2 years for non-participants and 9.8 years for participants; OR: .96, p<.01), and to have a higher SES (3.4 for non-participants and 3.7 for participants; OR: 1.13, p<.01). They also had a lower score on externalizing behavior at the first measurement than non-participants (participants 7.2 and non-participants 8.3, OR: .98, p<.05). In addition to providing information about their own behavior, all participants with children of 18 months or older were requested to fill in a questionnaire on their children's behavior, and a questionnaire about their parenting. In this text, the children who we have followed up to adulthood are referred to as 'G2' (Generation 2), the parents of these children are referred to as 'G1' (Generation 1) and the children of the G2 individuals are referred to as 'G3' (Generation 3).

Of the 1365 G2 participants in the 7th wave of the Zuid-Holland Study, 775 (57%) had a total of 1407 children. Participants with children were compared to participants without children by using logistic regression. Participants with children tended to be older (mean age at baseline was 11.4 for participants with children and 8.8 for participants without children, OR: 1.24, p<.01), female (of all participants 48% of the females and 31% of the males have children, OR: 2.30, p<.01) and to have a lower SES (3.4 for participants with children and 3.8 for participants without children on a scale from 1 to 6 with 1 being the lowest SES, OR: .83, p<.01) than participants without children. Fourteen G2 participants did not want to involve their children in the study, and 137 G2 participants did not return the questionnaires about their children. In this study we only included children for whom the Child Behavior Checklist 6-18 was available. A total of 279 G2 participants filled in usable questionnaires on 424 G3 children aged 6 years and older (mean age: 9.2 years). The mean age of the G2 participants at

first measurement was 12.8 years. Of the G2 participants, 188 were female and 91 participants were male. The G3 sample consisted of 215 boys and 209 girls.

Instruments

G3 child behavior

The Child Behavior Checklist (CBCL) (Achenbach & Rescorla, 2001b)is a parent-reported rating scale to assess behavioral and emotional problems in children. It can be scored on two broad-band groupings of syndromes: Internalizing and Externalizing Behavior. Good reliability and validity of the CBCL have been replicated for the Dutch translation (Verhulst et al., 1996)

G2 current behavior: the Adult Self-Report.

The Adult Self-Report (ASR) (Achenbach & Rescorla, 2003) is a self-report rating scale that is modeled after the CBCL. It is designed to assess emotional and behavioral problems for ages 18 to 59 years. It can be scored on eight syndrome scales and two broad-band groupings of syndromes.For this study we have used the broad band scale Externalizing Behavior. Good reliability and validity have been reported for the ASR (Achenbach & Rescorla, 2003).

G1 Parenting: EMBU

The EMBU (a Swedish acronym for My Memories of Upbringing) is a widely used self-report questionnaire to assess adults' recollections of their parents' parenting (Arrindell, Emmelkamp, Brilman, & Monsma, 1983). The short form of the questionnaire was used in this study, which consists of 23 items, and is based on the original 81-item EMBU. The shortened version of the EMBU has been shown to have good validity and reliability (Arrindell et al., 1999). Parenting recollections are measured on three scales: Rejection (7 items), Emotional Warmth (6 items) and Overprotection (10 items). Each item was rated on a 4-point scale from 1 (no, never) to 4 (yes, almost always). The items on the Rejection scale measure upbringing behavior characterized by hostility, punishment and blaming. The Overprotection scale measures parents' excessive anxiousness for the safety of their child, and their intrusive and guilt arousing parenting. The Emotional Warmth scale refers to parents' supportive, stimulating and affectionate parenting. We omitted the scale Emotional Warmth because it measures constructive parenting, and we wished to explore risk factors for the development of Externalizing Behavior.

The G2 participants reported the parenting of both their parents during the 6th wave of the study, in 1997, when they were 18-30 years old.

G2 parenting: EMBU-P

The EMBU for parents (EMBU-P; Markus, 2003) is a self-report rating scale modeled after the EMBU and has been developed to assess parents' actual parenting.

The EMBU measures parenting on four scales: Rejection, Overprotection, Emotional Warmth and Favoring Subject. PCA confirmed these four factors in the EMBU-P (EMBU-P; Markus, 2003). For this study we used the scales Rejection (22 items) and Overprotection (11 items). Reliability analysis revealed that the alpha coefficients for Rejection and Overprotection were .80 and .70, respectively, which is in line with previous research on the EMBU.

Each item was rated on a 4-point scale from 1 (no, never) to 4 (yes, almost always).

Socioeconomic Status (SES)

SES, assessed at the seventh measurement, was scored on a five-step Standard Classification of Occupations according to parental occupational and educational level (CBS, 2001).

Statistical analyses

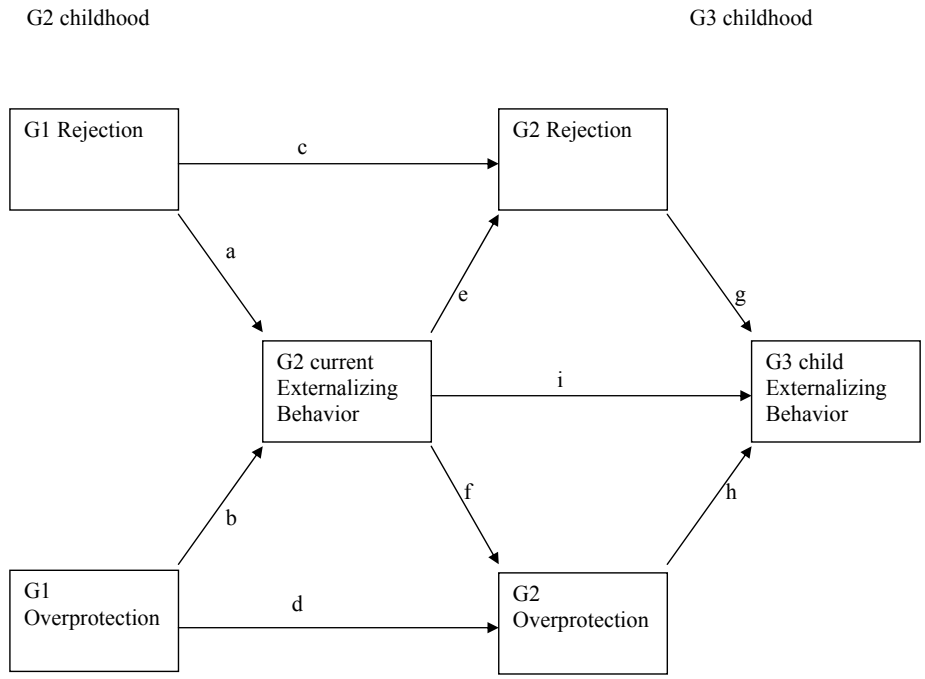
We conceptualized our models of intergenerational transmission of behavior in a set of structural equation models using Mplus (Muthén & Muthén, 1998-2007). Multilevel analyses (Boyle & Willms, 2001) were used to account for the within family clustering, because 34% of the G2 participants had two or more participating children. We included G1 and G2 parenting variables Rejection and Overprotection, G2 current Externalizing Behavior and G3 child Externalizing Behavior in the model. In the analyses G2 ratings on maternal and paternal parenting were combined in latent variables for G1 Rejection and Overprotection. Sex and age of G2 and G3 and SES of the G2 parent were included in each model as covariates.

Due to the relatively small number of G2 males (N=96) in the multilevel analyses it was not possible to compare the models for G2 males and G2 females. Therefore, we did not examine sex differences.

Model comparison

To come to our final model, we first tested mediation models to examine the direct and indirect transmission of parenting. In these models, we examined whether G2 current Externalizing Behavior functioned as a mediator in the relationship between G1 parenting and G2 parenting. Mediation was tested according to the procedure described by Holmbeck (Holmbeck, 1997). A mediational effect is tested by conducting 3 models: a direct model, a mediated model and a full model with both predictors added to the model. Our theoretical model is shown in Figure 4.1. In our direct model (model 1), we tested whether there was a direct relationship between G1 Rejection and Overprotection, and G2 Rejection and Overprotection (paths c and d). In our mediated model (model 2), the direct paths between G1 Rejection and Overprotection, and G2 Rejection and Overprotection were fixed to zero. We tested whether G1 Rejection and Overprotection were associated with G2 Externalizing Behavior (paths a and b), and whether G2 Externalizing Behavior was associated with G2 Rejection and Overprotection (paths e and f). Finally we created a full model (model 3) in which G1 Rejection and Overprotection, and G2 Externalizing Behavior predicted G2 Rejection and

Figure 4.1 intergenerational pathways to Externalizing problem behavior



Overprotection (paths a, b, c, d, e and f). Furthermore, all three models included the pathways from G2 parenting and G2 Externalizing Behavior to G3 Externalizing Behavior.

We chose the model with the best fit as our final model. Improvement in fit was assessed with a significance test on the basis of the difference between two model Chi-squares.

Results

In the correlation table (Table 4.1) is shown that significant correlations between most variables exist.G3 Externalizing Behavior was correlated with G2 Externalizing Behavior, G1 Rejection, G1 maternal Overprotection and G2 Rejection and Overprotection. It was not correlated with G1 paternal Overprotection. G2 Externalizing Behavior was correlated with G2 Overprotection and Rejection, and with G1 Rejection. G2 Rejection was correlated with G1 maternal Rejection, but not with G1 paternal Rejection. G2 Overprotection was correlated with G1 Overprotection.

Effect Estimates and model fit

Table 4.2 shows the estimates and model fit of the three models for testing the direct and indirect continuity of parenting. In model 1, G1 Overprotection significantly predicted G2

Table 4.1 Correlations between scales

	Externalizing G2 parents	Externalizing G3 children	Rejection G1 fathers	Rejection G1 mothers	Overprotection G1 fathers	Overprotection G1 mothers	Rejection G2 parents	Overprotection G2 parents
Externalizing G2 parents	1.00							
Externalizing G3 children	.31**	1.00						
Rejection G1 fathers	.19**	.19**	1.00					
Rejection G1 mothers	.25**	.30**	.60**	1.00				
Overprotection G1 fathers	.08	.06	.17**	.09	1.00			
Overprotection G1 mothers	.05	.11*	.18**	.13*	.67**	1.00		
Rejection G2 parents	.31**	.58**	.06	.16**	.03	.08	1.00	
Overprotection G2 parents	.23**	.28**	-.05	.01	.14**	.15**	.34**	1.00

**p<.01,*p<.05

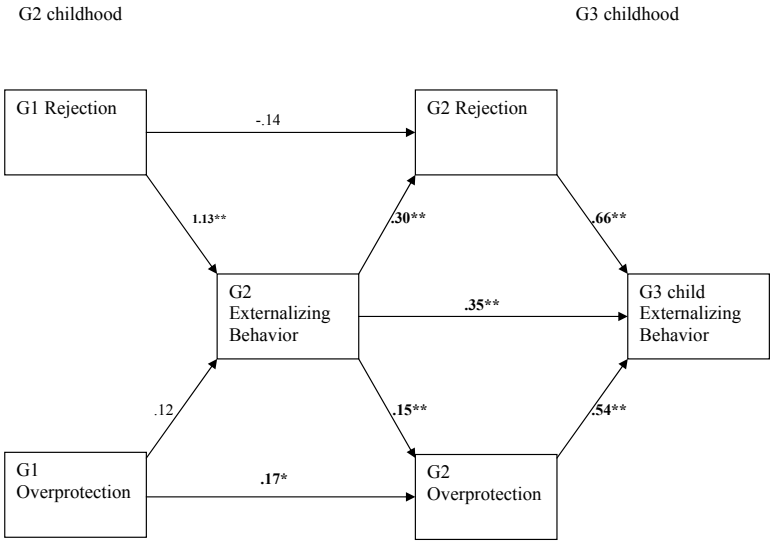
Overprotection, but G1 Rejection did not significantly predict G2 Rejection. In model 2, the indirect pathways from G1 Rejection to G2 Externalizing Behavior and from G2 Externalizing Behavior to G2 Rejection were significant. The indirect pathway for Overprotection was not significant because G1 Overprotection did not predict G2 Externalizing Behavior. Chi-square difference tests showed that model 3, in which both pathways were tested, was preferred over model 1 (χ^2diff=60.30, p<.01), and model 2 (χ^2diff=6.69, p<.05). Model 3 was therefore

Table 4.2 Prediction models for Externalizing Behavior, Rejection and Overprotection and their model fits (N G2=279, N G3=424).

Pathway	Model 1 Estimate	Model 2 Estimate	Model 3 Estimate
G1 Rejection to current G2 Externalizing		1.14**	1.13**
G1 Overprotection to current G2 Externalizing		.11	.12
G2 current Externalizing to G2 Rejection		.28**	.30**
G2 current Externalizing to G2 Overprotection		.17**	.15**
G1 Rejection toG2 Rejection	-.01		-.14
G1 Overprotection toG2 Overprotection	.17*		.17*
G2 Rejection toG3 Externalizing	.66**	.67**	.66**
G2 Overprotection to G3 Externalizing	.53**	.53**	.54**
G2 current Externalizing to G3 Externalizing	.15**	.35**	.35**
CFI	.83	.92	.93
RMSEA	.07	.05	.05
Chi Square	140.57	86.96	80.27
Df	43	41	39

**p<.01,*p<.05

Figure 4.2 results of modeling the intergenerational pathways of Externalizing problem behavior.



Chi-Square= 80.27, CFI=.93, RMSEA=.05
**p<.01, *p<.05

used as our final model. In model 3, there was an indirect path between G1 Rejection and G2 Rejection. The direct path from G1 Rejection to G2 Rejection was not significant (estimate=-.14). G2 Externalizing Behavior cannot be called a mediator in this relation, because there was no direct relation between G1 Rejection and G2 Rejection in model 1, but Rejection does continue indirectly, through G2 Externalizing Behavior. In contrast, the direct path from G1 Overprotection to G2 Overprotection was significant (estimate=.17, p<.05). The indirect path was not significant because there was no significant association between G1 Overprotection and G2 Externalizing Behavior. G2 Rejection, G2 Overprotection and G2 Externalizing Behavior were all significantly associated with G3 Externalizing Behavior. Figure 4.2 shows our final model. There is a significant indirect path from G1 Rejection to G2 Rejection and a significant direct path from G1 Overprotection to G2 Overprotection. G2 Rejection, G2 Overprotection and G2 Externalizing Behavior all predicted G3 Externalizing Behavior.

Discussion

In the present study we used a general population sample to investigate the role of parenting in the intergenerational transmission of externalizing behavior. We also examined whether parenting was transmitted across generations. Two different parenting dimensions, rejection and overprotection, were analyzed. We tested whether these parenting dimensions were

transmitted across generations and if they were transmitted directly or indirectly through G2 externalizing behavior.

In our final model, there was a relation between G2 and G3 externalizing behavior, which indicates intergenerational transmission of externalizing behavior. G2 externalizing behavior and both parenting dimensions, rejection and overprotection, predicted G3 externalizing behavior. All three factors were directly or indirectly predicted by G1 parenting. As expected, parenting plays a role in the intergenerational transmission of externalizing behavior. G1 overprotection predicted G2 overprotection directly whereas G1 rejection predicted G2 rejection indirectly, through G2 externalizing behavior. These results indicate intergenerational transmission of parenting.

Our results suggest that direct and indirect transmission of parenting both play a role in the intergenerational transmission of externalizing child behavior. However, whether parenting is transmitted directly or indirectly through parental externalizing behavior depends on the parenting dimension that is measured. These findings indicate that it is difficult to describe the precursors and effects of parenting when different dimensions of parenting are combined in one parenting factor. It appears that different dimensions each have their own precursors and effects. When examining the intergenerational transmission of parenting, it is therefore important to focus on only one parenting dimension at a time or analyze different parenting dimensions as separate constructs.

The current results are most in line with the findings of Capaldi et al. (Capaldi et al., 2003) who found direct and indirect transmission of parenting as well. The resemblance may be explained by the way the concept of parenting was constructed in the Capaldi study. Both rejection and control elements were included in their construct of parenting, which could have been the reason why both types of transmission were found.

It is interesting that we only found a direct transmission of overprotection. It is possible that attempts to control a child's whereabouts are learned by individuals by watching their parents, and used by the individuals when they have children of their own. The results of several studies suggest that overprotective parenting is associated with the development of a foreclosed, or normative identity style (Berzonsky, 2004; Perosa, Perosa, & Tam, 1996; Smits et al., 2008). According to the identity development theory of Berzonsky, individuals with a normative identity development rely on the norms and expectations of significant others, such as parents or authority figures. Thus, according to this theory, the children of overprotective parents are more likely to copy behavior, such as parenting behavior, from their own parents. This is in line with the results of the present study. However, it is also possible that we found a direct transmission of overprotection because other possible transmission mechanisms were not taken into account in this study. For example, overprotection may be transmitted through parental internalizing problems instead of externalizing behavior. In this study however, we did not test this hypothesis because parental internalizing problems were not taken into account.

Furthermore, only indirect transmission of rejection was found. This means that harsh punishment and hostility were not transmitted across generations by social learning. We did not find that parents punish their children in a harsh way or deprive them from affection because they copied the behavior their own parents exhibited when they were children. According to our results, hostile parenting is associated with the current externalizing behavior of the parent. When a parent has externalizing problems, the parent is more likely to rear the child in a hostile, harsh way. Because children that had a hostile upbringing are more likely to develop externalizing behavior themselves, they are more likely to raise their children in the same way they were raised. This is in line with commonly used theories on the intergenerational transmission of externalizing behavior (Serbin & Karp, 2004).

It is however possible that we did not find direct transmission of rejective parenting because of the nature of the sample we used. In a community-based sample like ours, parents will usually not show extremely rejective parenting behaviors. Rejection in at-risk samples may be a more abusive type of parenting that perhaps should be seen as a separate parenting dimension. Extremely rejective parenting may be transmitted in a different way than rejection in a community sample. Furthermore, the most extreme forms of rejective parenting may not be present in the sample anymore, because the most problematic individuals within a community sample are the first to drop out.

Limitations and strengths

One limitation of the present study is the retrospective way in which G1 parenting was measured. The reliability of retrospective reports is controversial, and studies on this subject have come to contrasting results (Fergusson, Horwood, & Woodward, 2000; Hardt, Sidor, Bracko, & Egle, 2006; Offer et al., 2000). However, the EMBU was filled out by the participants 10 years before we assessed their current externalizing problems, and both measures were still associated. Another limitation is G2 participants being the only source of information for G2 current behavior, G2 parenting and G1 parenting. Preferably, the G3 children would have reported on the parenting they experienced, but this was not possible at this time, because of the young age of many of the G3 children. Furthermore, it would have been an advantage to have multiple sources of information, for example home observations and questionnaires measured in both the G1 and G2 generation. However, we had the advantage of being able to use different versions of the same instrument for both generations of parenting. By doing this we were able to compare similar parenting dimensions that were measured with a similar instrument. Finally, it would have been an advantage if our sample was large enough to test sex differences. The sex differences in correlations between G1 parenting behaviors and G2 externalizing behavior and parenting, suggest that sex differences may exist.

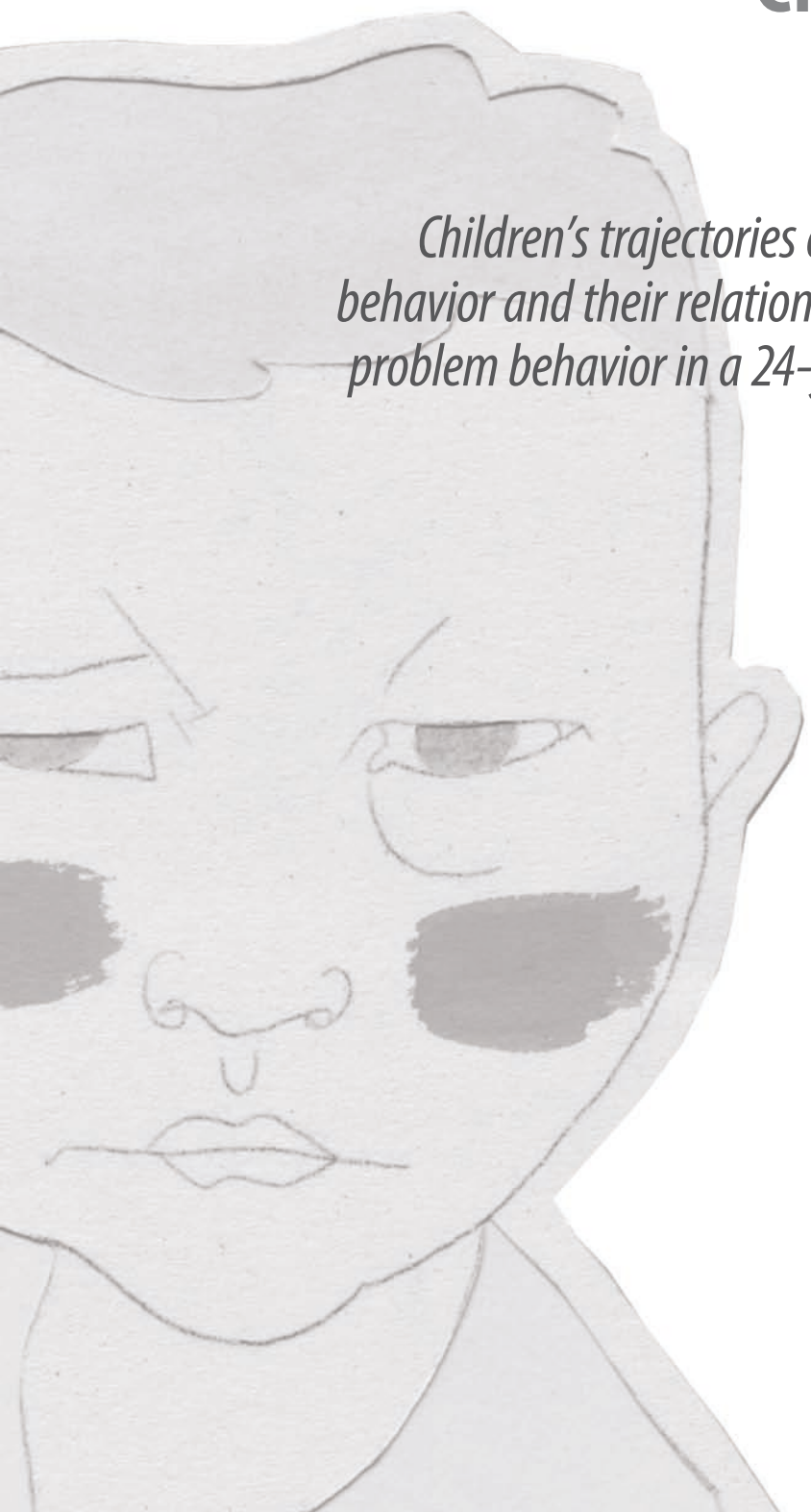
The present study also has some major advantages. The design of the study is unique; no previous study has compared the intergenerational transmission of two parenting dimensions when investigating the transmission of externalizing behavior. The sample size of the

study is relatively large and parents and children of both sexes were included in the sample, which makes it easier to generalize the results. Generalizability is also an advantage of the type of sample that we used. Most intergenerational studies use high-risk samples (Capaldi et al., 2003; Conger et al., 2003; Thornberry et al., 2003), whereas we have used a community-based sample. In high-risk samples the effects of pathological, extreme behaviors are investigated, but high-risk studies are not necessarily suitable for drawing conclusions that can be applied to individuals in the community. It is therefore important that transmission is studied in community-based samples as well.

Conclusions

The findings of the present study indicate that the parenting dimensions rejection and overprotection play different roles in the intergenerational transmission of externalizing behavior. Although both factors predict higher levels of offspring externalizing behavior, the parenting dimensions themselves have different precursors. These results emphasize the importance of treating different parenting dimensions as separate constructs when doing intergenerational research. Furthermore, these results tell us that parental coaching should focus on different aspects of parenting. Even if the harsh and punishing aspects of parenting are improved, controlling and intrusive behaviors may still have a negative impact on the behavioral development of the child, and on the disruptive cycle that then still may develop. In general, we would like to suggest a stronger consciousness of the differences between parenting dimensions in the intergenerational transmission of externalizing behavior.

Chapter 5



Children's trajectories of internalizing behavior and their relation with offspring problem behavior in a 24-year follow-up

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Submitted for publication

Abstract

Background: Existing research on intergenerational transmission of internalizing problems has mainly compared parental internalizing problems at one point in time with offspring problem behavior. The parental development of internalizing problems has not been taken into account.

Aims: To investigate associations between parental development of internalizing problems during childhood, and offspring problem behavior.

Methods: In a multi-cohort, population-based sample (N=2076), parental internalizing problems were assessed five times when participants were aged 4-18. Trajectories of internalizing problems were determined using General Mixture Modeling. Offspring problem behavior was assessed 24 years after the initial assessment. With multilevel modeling, the associations between parental trajectories and offspring problem behavior were examined.

Results: Increasing and decreasing trajectories of internalizing problems predicted elevated levels of internalizing problems in offspring. The maternal decreasing trajectory predicted elevated levels of externalizing behavior.

Discussion: When the developmental course of parental internalizing problems is not considered, we may miss the association between parental internalizing problems and offspring problem behavior.

Introduction

Internalizing problems such as anxiety, depression and somatic problems without known medical cause, are relatively common in children. In 1997, the prevalence of DSM-III anxiety disorders in Dutch adolescents between 13 and 18 was about 17%, and the prevalence of mood disorders was about 3% (Verhulst, van der Ende, Ferdinand, & Kasius, 1997). Furthermore, parent reported internalizing problems in Dutch children seem to have increased slightly between 1993 and 2003 (Tick, van der Ende, & Verhulst, 2007). To learn more about precursors and risk factors for the development of internalizing problems in children, the impact of parental internalizing problems on their children's problems has been studied extensively in the last decennia. This research has found associations of parental internalizing problems with a wide range of disorders in offspring (Burt et al., 2005; Frye & Garber, 2005), including anxiety (Beidel & Turner, 1997; McClure et al., 2001), antisocial behavior (Chronis et al., 2007; Kim-Cohen et al., 2005) and depression (Merikangas et al., 1998). The results of studies on parental internalizing problems and offspring development therefore indicate that parental internalizing problems indeed form a risk factor for offspring development. However, it is difficult to determine the exact relation between parental internalizing problems and offspring developmental problems from these studies. In most studies, adult parents' problems and their children's problems are assessed at only one point in time and then compared to each other. Comparing adult psychopathology to child psychopathology is difficult because the nature and expression of psychopathology will differ between children and adults. Resemblance between parents and offspring may go unnoticed because they are assessed at different developmental stages. This problem can be solved by assessing parents and children when they are in the same age range. Some longitudinal studies have compared the behavior of parents assessed in childhood, with the behavior of their offspring in childhood (Cohen et al., 1998; Serbin et al., 1998). These studies found continuities in childhood internalizing behavior between parents and their offspring. In another longitudinal study on transmission of depression, parents and offspring were compared when they were both young adults (Weissman et al., 2006). In this study intergenerational transmission of depression was found as well.

However, both ways of comparing the behavior of parents and their offspring do not take individual differences in the development of parental internalizing behavior into account.

In the last decennia, longitudinal studies have provided evidence for the existence of different subpopulations of individuals with distinct developmental trajectories of internalizing problems (Brendgen et al., 2005; Dekker et al., 2007; Feng, Shaw, & Silk, 2008; Sterba et al., 2007; Stoolmiller et al., 2005). At least three subpopulations were found in each study with the majority of the individuals scoring consistently low on internalizing problems. The other subgroups varied between the studies. For example, the development of internalizing problems may show an increase (Brendgen et al., 2005; Dekker et al., 2007) or decrease (Dekker et

al., 2007; Stoolmiller et al., 2005) over time for certain individuals. Considering these results, it is possible that two individuals, who exhibit similar levels of internalizing behavior at a certain age, actually follow different pathways with regard to the development of their internalizing problems (Bergman & El-Khouri, 2003; von Eye & Bergman, 2003). When we do not take the development of the internalizing problems into account, we may miss certain associations between parent and offspring problem behavior. In the present study we will therefore investigate in what ways parental trajectories of childhood internalizing problems predict levels of offspring internalizing and externalizing problems.

Methods

Population and procedure

The Zuid-Holland study is a longitudinal general population study that started in 1983. A random sample of 2600 children and adolescents from 4 to 16 years of age was drawn from municipal registers of the Dutch province of Zuid-Holland which encompasses both urban and rural areas. Parents were asked to complete the Child Behavior Checklist (CBCL) on the behavior of their child. Of the 2447 parents reached, 2076 (84,8%) provided usable information about their children. After the first measurement in 1983 (time 1), the sample was approached again in 1985 (time 2), 1987 (time 3), 1989 (time 4), 1991 (time 5) , 1997 (time 6) and 2007 (time 7). For details on the initial data collection, see Verhulst et al.(Verhulst, Akkerhuis et al., 1985).

For the 7th measurement, all participants, now aged 27 to 40, were contacted between January 2006 and July 2007, except for 23 who had deceased, 10 who were intellectually disabled and 264 who could not be traced. Usable information was provided by 1365 participants (66%). We used logistic regression to investigate if demographic characteristics were associated with participation at time 7. The participants at time 7 were more likely to be female (of all participants at time 1 70% of the females and 62% of the males participate at time 7; OR: 1.39, $p < .01$), younger (mean age at baseline was 10.2 years for non-participants and 9.8 years for participants; OR: .96, $p < .01$), and to have a higher SES (3.4 for non-participants and 3.7 for participants; OR: 1.13, $p < .01$). They also had a lower score on externalizing behavior at the first measurement than non-participants (participants 7.2 and non-participants 8.3, OR: .98, $p < .05$). In addition to providing information about their own behavior, all participants with children of 18 months or older were requested to fill in a questionnaire on their children's behavior. In this paper, the first generation participants are referred to as 'G1'and their children as 'G2' (Generation 2).

Of the 1365 G1 participants in the seventh wave of the Zuid-Holland Study, 775 (54%) had a total of 1407 children. Participants with children were compared to participants without children by using logistic regression. Participants with children tended to be older (mean age

at baseline was 11.4 years for participants with children and 8.8 years for participants without children, OR: 1.24, p< .01), female (of all participants 48% of the females and 31% of the males had children, OR: 2.30, p< .01) and to have a lower SES (3.4 for participants with children and 3.8 for participants without children, OR: .83, p< .01) than participants without children. Of the participants with children, 14 refused to provide information about their children, and 137 participants did not return the questionnaires about their children. Two different versions of the CBCL were used. Depending on the age of the G2 children, the CBCL/1.5-5 or the CBCL/6-18 was used. A total of 536 G1 participants (N G1 males = 186, N G1 females = 350) filled in usable questionnaires on a total of 939 G2 children aged 1.5-18 years. Of these 536 G1 participants, 225 had only one child; the other 311 G1 participants had two or more children. The mean age of the G2 children was 5.8 years.

Instruments

Child Behavior Checklist

The CBCL is a rating scale for parents to assess behavioral and emotional problems of children. All versions of the CBCL can be scored on 2 broad-band groupings of syndromes: Internalizing and Externalizing. Good reliability and validity of the CBCL have been replicated for the Dutch translation (Verhulst et al., 1996). For the first five measurements, the CBCL/4-16 was used to assess internalizing problems of the G1 parents. For the G2 children at the 7th measurement the CBCL/1,5-5 (Achenbach & Rescorla, 2001a) and CBCL/6-18 (Achenbach & Rescorla, 2001b) were used. To compare the CBCL version for pre-school children with the version for school-age children, we divided the Internalizing and Externalizing scores of the pre-school children by the number of items on the scales, and multiplied the outcome by the number of items on the Internalizing and Externalizing scales of the school-age version.

G1 SES

G1 SES was scored on a five-step Standard Classification of Occupations according to parental occupational and educational level (CBS, 2001).

Statistical analyses

G1 internalizing trajectories

For determining the trajectories, information from waves 1-5 was used. We only used information from the first five waves because the CBCL cannot be used for individuals beyond the age of 18, and at wave six, all individuals were beyond the age of 18. Therefore we conducted trajectories for the ages 4 to 18. All children who were at any of the 5 assessment points between the ages 4 and 18 were included in this study (Table 5.1). A completed CBCL from at least two assessment waves was available for 77.1% of the children, a completed CBCL from

Table 5.1 Number of males and females by wave of measurement

	Wave 1 (1983) 4-16 years			Wave 2 (1985) 6-16 years			Wave 3 (1987) 8-18 years			Wave 4 (1989) 10-18 years			Wave 5 (1991) 12-18 years		
cohort	Age	M	F	Age	M	F	Age	M	F	Age	M	F	Age	M	F
1	4	81	84	6	69	64	8	69	71	10	72	76	12	71	75
2	5	78	90	7	65	73	9	65	75	11	70	73	13	69	73
3	6	78	83	8	63	71	10	65	70	12	65	71	14	68	74
4	7	89	85	9	67	72	11	65	71	13	67	74	15	66	71
5	8	81	83	10	66	62	12	77	64	14	72	69	16	67	65
6	9	78	78	11	66	72	13	60	71	15	67	73	17	62	67
7	10	78	83	12	59	63	14	59	67	16	64	69	18	60	66
8	11	77	83	13	65	66	15	66	69	17	62	72			
9	12	78	76	14	63	61	16	55	63	18					
10	13	78	83	15	52	65	17	43	51						
11	14	69	82	16	50	57	18	37	41						
12	15	75	70	17	1										
13	16	76	80	18											
total		1016	1060		686	726		661	713		539	577		463	491

M=males, F=Females

at least three waves was available for 68.3% of the children, for 50.3% a completed CBCL was available from at least four waves and for 38.1 % a CBCL at all five waves was available.

We used Growth Mixture Modeling (GMM) (Muthén & Muthén, 2000; Muthén & Muthén, 1998-2007) to investigate which Internalizing trajectories would emerge among children aged 4 to 18. The GMM analyses were conducted in Mplus, version 5. With GMM it is possible to identify latent classes of individuals with different Internalizing trajectories across age. Random effects represent the within-class variation in GMM.

We estimated models to determine the optimal number of trajectories. For determining the model fit, we used both the BIC value and the Loh-Mendell-Rubin likelihood ratio test (LMR-LRT) (Jung & Wickrama, 2007; Lo, Mendell, & Rubin, 2001). We evaluated the BIC values, according to the guidelines by Raftery (Raftery, 1995): if the difference in BIC values for two models is larger than two, we consider the model with the smallest BIC to be a better model. The LMR-LRT compares the fit of the current model with a model that has one class less. A significant test value indicates that the current model is preferred above the model with one class less. Therefore, when choosing our final model we decided to choose the model that has the lowest BIC value but still has a significant LMR-LRT statistic. The entropy is a measure of classification accuracy that gives us additional information about how precise the model has assigned each individual to his or her most likely class. Entropy values range from 0 to 1 with 1 indicating greater precision.

Sex differences in G1 trajectories

To see if the number and profiles of the trajectories found in step 1 held for males and females, a loglikelihood difference test was performed Muthén & Muthén. For this purpose, a multiple-

group analysis was performed first. Based on our final model, two multiple-group analyses with grouping variable sex were carried out. In the first model we constrained the intercepts, linear and quadratic slopes of each trajectory to be equal across males and females. In the second model the intercept, linear and quadratic slopes of each trajectory were allowed to be different across males and females. Next, a loglikelihood difference test between the two models was computed. If the loglikelihood difference test is not significant, this means that equality constraints do not worsen the fit of the model and the model with no differences between males and females is preferred. If the loglikelihood difference test is significant, the model with the best fit is preferred.

Multilevel analyses: predicting offspring internalizing and externalizing problems from G1 internalizing trajectories.

The SPSS Mixed procedure was used to investigate whether G1 Internalizing trajectories predicted G2 child Internalizing and Externalizing problems. We used multilevel analyses (Boyle & Willms, 2001) to account for the within family clustering, because 49% of the G1 participants had 2 or more participating children. In these analyses, the G1-trajectories were represented by a multiple-category independent variable. In each model, G2 sex, age of G1 and G2 and G1 SES were included as confounders. Interactions of G1 trajectories with G1 and G2 sex were tested to see if the sex of the parent or the child modified the effect of the G1 trajectories on G2 problem behavior.

Results

Identifying trajectories of childhood Internalizing Problems in parents

As a first step, we determined the optimal number of Internalizing trajectories of G1 participants. Test statistics can be found in Table 5.2. The BIC value of the three-class model (38796.3) was lower than the BIC value of the two-class model (39092.3), and of the 1-class model (42753.7). The LMR-LRT test statistic of the three-class model was significant. When comparing the four-class model to the three-class model, the BIC value of the four-class model (38654.4) was again significantly lower than the BIC value of the three-class model. However, the LMR-LRT test statistic was not significant. The entropy of the three-class model was also

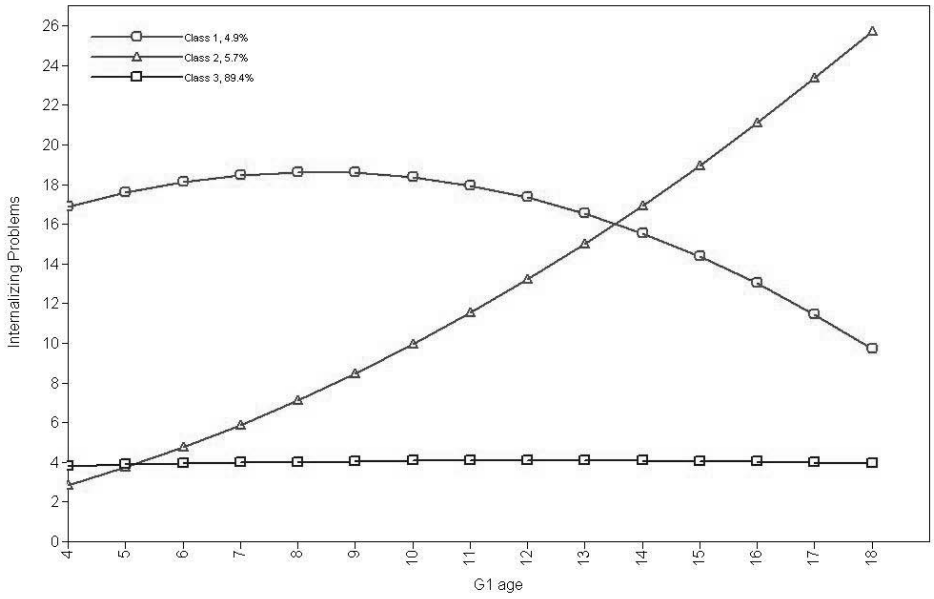
Table 5.2 Fit indices for general growth mixture models

G1 males and females	BIC	Entropy	LMR-LRT
1-class model	42753.7	-	-
2-class model	39092.3	.93	669.48**
3-class model	38796.3	.93	325.61*
4-class model	38654.4	.88	175.49

*p<.05, **p<.01

closer to 1 than the entropy of the four-class model. Models with 5 and 6 trajectories could not be estimated. Taking into account the BIC value, the significant LMR-LRT and the entropy, we selected the three-class model as our best fitting model. The trajectories of the three-class model are shown in Figure 5.1. The three classes can be described as follows: the first class comprises 4,9% of the G1 individuals. They start off at high levels of Internalizing Problems and decrease slowly when they reach adolescence. When they are 18 years old, their levels of Internalizing Problems are still somewhat elevated. We denote this class the 'decreasing group'. The second class comprises 5,7% of the G1 individuals. They start off at a low level of Internalizing Problems, but at young age, their problems increase and at age 18, they have reached a high level of Internalizing Problems. Compared with the decreasing group, their levels of Internalizing Problems at age 18 are high. We denote this class the 'increasing group'. The third class comprises 89,4% of the G1 individuals. Their levels of Internalizing Problems are consistently low. We denote this class the 'low group'. As a second step we conducted a multiple group analysis to investigate whether the three-class model could be applied to both males and females. The loglikelihood difference was not significant ($\Delta\chi^2$ diff=16.32, df=9), which means that the model with equal intercepts, linear and quadratic slopes for males and females was the preferred model. Therefore, we used one model for males and females.

Figure 5.1 G1 Internalizing trajectories for G1 participants



Using G1 internalizing trajectories to predict G2 internalizing behavior

The number of parents in each trajectory matched to one or more G2 children is shown in Table 5.3. The results of the multilevel analyses are presented in Table 5.4 and 5.5. With regard

Table 5.3 Number of children with parent in trajectory class 1, 2 and 3.

Trajectory class	Number of parents in class:	Number of children with parent in class:
Decreasing	20 (3.7%)	36 (3.8%)
Increasing	27 (5.0%)	46 (4.9%)
Low	489 (91.3%)	857 (91.3%)
Total	536 (100%)	939 (100%)

to internalizing problems, both mothers and fathers in the G1 increasing and the decreasing group predicted higher levels of Internalizing Problems in G2 offspring than the low group. As for externalizing problems, the sex-interaction G1males*decreasing was significant, which implied that only mothers in the decreasing group predicted G2 Externalizing Behavior (mean G2 externalizing for decreasing trajectory mothers: 17.67, mean G2 externalizing for decreasing trajectory fathers: 9.02).

Tabel 5.4 G1 Internalizing trajectories as a predictor of G2 Internalizing behavior, results of the multilevel analyses

Trajectory class	Estimate	95% CI
Intercept	4.16**	2.68-5.64
Decreasing Group	1.80*	.018-3.58
Increasing Group	2.65**	.1.08-4.23
Low Group (ref)	0	-
Sex G1	-.51	-1.24-5.64
Sex G2	-.32	-.90-.27
Age G1	-.06	-.18-.06
Age G2	.26**	.18-.36
SES G1	.03	-.18-.23

*p<.05, **p<.01

Table 5.5 G1 Internalizing trajectories as a predictor of G2 Externalizing Behavior, results of the multilevel analyses

Trajectory class	Estimate	95% CI
Intercept	18.05**	15.37-20.74
Decreasing Group	7.63**	3.75-11.51
Increasing Group	2.00	-1.02-5.03
Low Group (ref)	0	-
G1males*Decreasing group	-8.94*	-16.03- -1.85
G1males*Increasing group	-.69	-10.07-8.69
Sex G1	.29	-1.07-1.65
Sex G2	1.28*	.25-2.30
Age G1	-.21	-.42-.00
Age G2	-.81**	-.98--.64
SES G1	-.35	-.72-.02

*p<.05, **p<.01

Discussion

In the present study we investigated whether trajectories of childhood internalizing problems predicted offspring internalizing and externalizing problems. Data were collected in a multi-cohort longitudinal community-based study. G1 trajectories were specified for the development of internalizing problems in 4 to 18-year-old individuals. The associations between the trajectories of these individuals and their offspring's internalizing and externalizing problems were then investigated.

The G1 individuals followed one of the following three internalizing trajectories: a low trajectory, a decreasing trajectory and an increasing trajectory. The G1 trajectories predicted offspring problems. The increasing trajectory and the decreasing trajectory predicted significantly higher levels of G2 offspring internalizing problems than the low trajectory. Furthermore, mothers in the decreasing internalizing trajectory predicted offspring externalizing behavior.

Our results indicate that developmental pathways of internalizing problems differentiate between levels of internalizing problems for offspring. Decreasing as well as increasing trajectories predicted elevated levels of internalizing problems in offspring, compared to the consistently low trajectory. This means that it does not make a difference whether parents start off at a high level of internalizing problems that decreases during childhood, or whether parents start off at a low level of internalizing problems that increases during childhood. The offspring of parents following each of these patterns is more likely to develop internalizing problems. These results suggest that the assessment of parental internalizing problems at one time point may provide incomplete information about the transmission of internalizing problems from parents to their offspring. For example, parents who were only measured in adolescence and did not have an elevated level of internalizing problems at that time point, still put their children at risk for developing internalizing problems when their level of internalizing problems had been high in childhood. When parents are only measured in childhood and do not have internalizing problems at that point in time, they may still form a risk factor for their children when they start developing internalizing problems in adolescence.

The associations between the increasing trajectory and G2 offspring internalizing problems may be explained as follows. A previous study found that individuals who followed elevated trajectories of depression during their whole childhood or started at adolescence, had significantly more depressive and other mental health problems in young adulthood (Dekker et al., 2007). It is known that parents with mental health problems are more likely to provide their children with a less favorable environment, which may facilitate the development of offspring internalizing behavior (Goodman & Gotlib, 1999; Johnson et al., 2001; Leinonen et al., 2003). Thus, parents on the increasing trajectory are more likely to provide their children with a less favorable environment, which in turn puts their children at risk for developing internalizing problems themselves. However, it is less likely that the associations we found

in the present study between the decreasing trajectory and elevated levels of offspring internalizing problems are also related to mental health problems of the adult parents. The decreasing trajectory in the study of Dekker et al. (Dekker et al., 2007) did not predict mental health problems in young adulthood.

Perhaps another mechanism underlies the associations between the internalizing trajectories and offspring internalizing problems. The child may inherit the trajectory of its parent. Results from behavioral genetic studies showed a genetic contribution to stability and change in problem behavior (Bartels et al., 2004; van der Valk, van den Oord, Verhulst, & Boomsma, 2003). This means that, when a child inherits genes from its parent, the development of internalizing behavior may show a similar pattern for parent and child. In the present study, the offspring of parents in the decreasing group would start off at a high level of internalizing behavior, and decrease during childhood and adolescence. In the same way, the offspring of increasing parents would start off at a low level of internalizing behavior, and increase during adolescence. This mechanism may explain the associations between both the increasing and the decreasing trajectories with offspring internalizing problems.

However, it is also possible that different mechanisms underlie the associations between the different trajectories and offspring internalizing problems. The association between the increasing trajectory and offspring internalizing problems may be explained by higher levels of parental problem behavior in adulthood, whereas inheritance of a behavioral trajectory may underlie the associations between the decreasing trajectory and offspring internalizing problems.

It is surprising that we found such a strong association between the maternal decreasing trajectory and externalizing behavior. It is possible that in our study, offspring externalizing behavior was in fact not associated with the decreasing trajectory of internalizing problems, but with co-developing externalizing behavior. Some studies have found evidence for the co-development of externalizing and internalizing behaviors in childhood (Gilliom & Shaw, 2004; Keiley, Bates, Dodge, & Pettit, 2000). In these studies, higher levels of internalizing problems were associated with higher levels of externalizing problems and rates of change were also positively correlated across domains. Therefore, the found associations may not reflect a relation between the decreasing internalizing trajectory and offspring externalizing behavior, but a relation between a maternal externalizing trajectory in childhood and offspring externalizing behavior.

Still, it is surprising that we only found an association between a maternal trajectory and externalizing behavior. A meta-analysis on studies that tested the effects of maternal and paternal psychopathology on offspring behavior indicated that the effects of both sexes on offspring externalizing behavior were comparable (Connell & Goodman, 2002). However, the reviewed studies did only assess maternal psychopathology at one time point. Our person-centered, longitudinal approach of parental psychopathology differentiates the present

study from previous studies. Because we assess a development instead of behavior on a static time point, sex differences may vary.

Limitations and strengths

A total of 1365 of the original 2076 participants were willing to participate in the 7th measurement, and therefore, a selection bias could have appeared. We do not know how many of the participants not included in the 7th measurement have children and we do not know anything about their current mental health, or the health of their children. Our analyses indicated that participants in the 7th measurement wave were more likely to have had lower externalizing levels at the first wave. It is therefore possible that a group of participants with higher levels of externalizing behavior dropped out, but we cannot deduce if this attrition would have had an effect on the internalizing trajectories specified in the present study and the impact of these trajectories on offspring internalizing behavior. Furthermore, the number of G1 females in the present analyses was twice as large as the number of males. Future studies need larger sample sizes for males to replicate the present analyses.

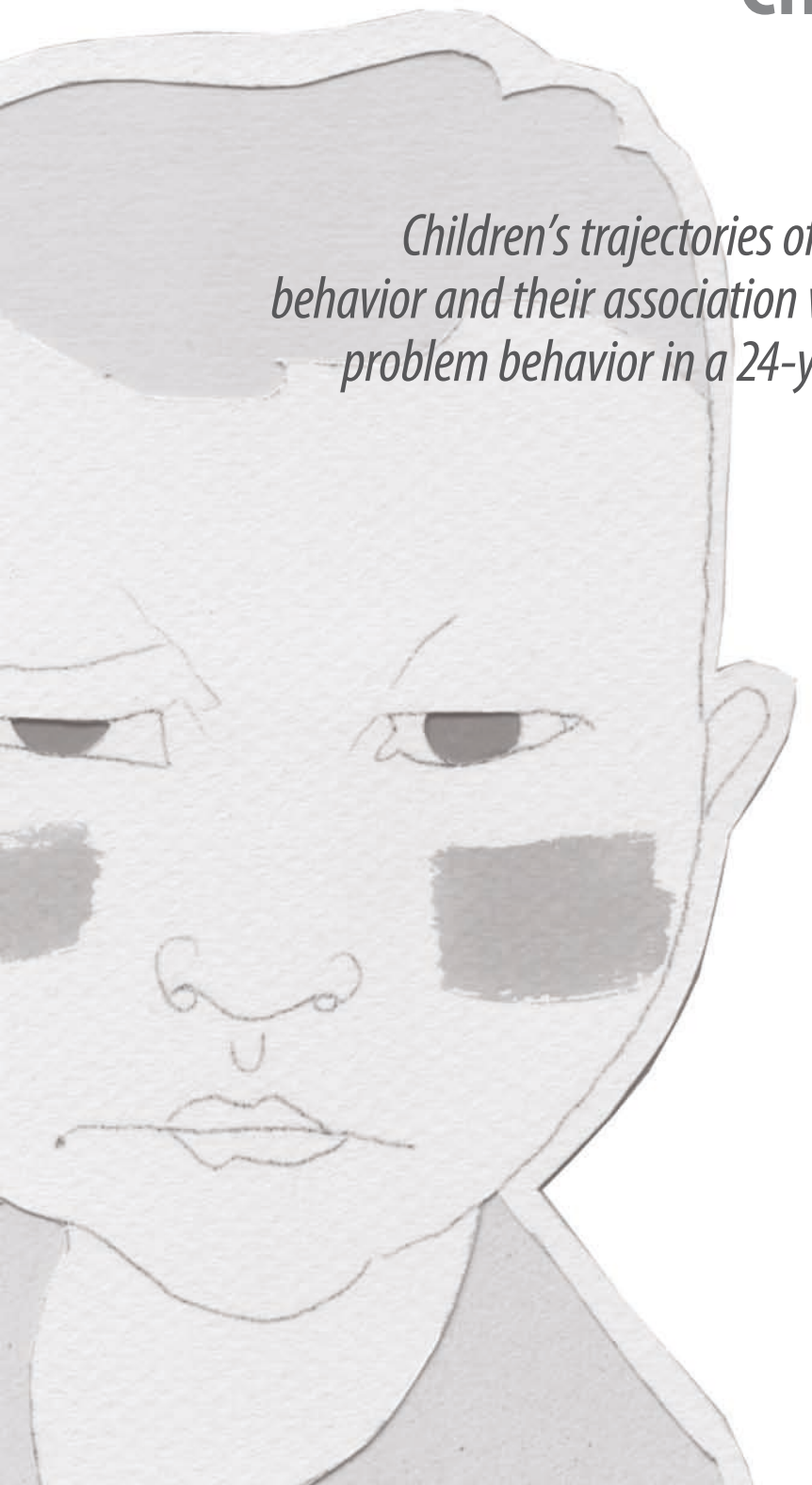
Despite these limitations, the present study has some major advantages. With our study design, two generations of child behavior were assessed prospectively in a relatively large sample. G1 trajectories have been specified out of measurements at five time-points and cover the whole childhood-adolescence age-range. Similar instruments have been used for the assessment of G1 child behavior and offspring child behavior, which makes comparisons justified.

Conclusions

In the present study, we determined trajectories of parental internalizing problems in childhood to predict offspring internalizing and externalizing behavior. In our study, the parental increasing and decreasing trajectories predicted elevated levels of internalizing problems in offspring. Elevated levels of offspring externalizing behavior were only predicted by decreasing trajectories of mothers. Our results indicate that it does not matter whether parents have elevated levels of internalizing problems in childhood, or in adolescence. In both cases, the offspring of these parents are at risk for developing problem behavior. This means that, when the developmental course of parental internalizing problems is not taken into account, we may miss the association between parental internalizing problems and offspring problem behavior. When measuring parental internalizing problems at one point in time, one should be cautious in drawing conclusions about the effect of parental internalizing problems on offspring problem behavior.

For future studies it will be important to replicate and elaborate on these findings. It will be a challenge to investigate why different developmental courses lead to different offspring outcomes, and what the mechanisms are behind the associations between the parental trajectories and offspring problem behaviors.

Chapter 6



Children's trajectories of externalizing behavior and their association with offspring problem behavior in a 24-year follow-up

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Submitted for publication

Abstract

Objective: Research on the intergenerational transmission of externalizing problems has mainly compared parental externalizing problems at one point in time with offspring problem behavior. In the present study, associations between parental developmental trajectories in their childhood of externalizing problems and offspring externalizing and internalizing problems were investigated.

Methods: In a population-based sample, parental externalizing problems were assessed five times when they were aged 4-18 years, using the Child Behavior Checklist (CBCL). Trajectories of externalizing problems were determined using General Mixture Modeling. Internalizing and externalizing problems of the offspring (N=939) aged 1.5 to 18 years were assessed using the CBCL 24 years after their parents' initial assessment. Associations between parental trajectories and offspring problem behavior were examined with multilevel modeling.

Results: The analyses yielded separate trajectories for males and females. The trajectories for males did not predict the level of the offspring's problem behavior. The female adolescent-increasing trajectory predicted elevated levels of offspring externalizing and internalizing behavior. The female decreasing trajectory predicted elevated levels of offspring externalizing behavior only in boys.

Conclusion: The development of maternal externalizing behavior seems important in the development of offspring problem behavior. Future studies need to confirm these results and elaborate on the present findings.

Introduction

Antisocial behavior places a large burden on society in costs as well as in emotional and physical damage. Therefore, research has since long been focused on precursors of the development of antisocial behavior. Many studies have confirmed that having antisocial parents increases the risk for developing both externalizing and internalizing behavior (Blazei et al., 2008; Johnson, Cohen, Chen et al., 2006; Smith & Farrington, 2004). Cross-sectional studies comparing current parental behavior with that of their offspring, reported that parental antisocial characteristics form a risk factor for their offspring's development. Furthermore, longitudinal studies that looked at the trans-generational transmission of antisocial behavior indicated that antisocial child behavior of parents is associated with offspring problem behavior as well (Kaplan & Liu, 1999; Thornberry et al., 2003). Both types of studies looked at parental antisocial behavior as a risk factor assessed at one point in time but did not take differences in developmental patterns of parental antiscocial behavior into account.

In the last decennia, longitudinal studies have provided evidence for the existence of individual differences in the development of externalizing problems (Campbell, Spieker, Burchinal, & Poe, 2006; Cote, Vaillancourt, LeBlanc, Nagin, & Tremblay, 2006; Fergusson & Horwood, 2002; Schaeffer et al., 2006; Schaeffer, Petras, Ialongo, Poduska, & Kellam, 2003; Shaw, Gilliom, Ingoldsby, & Nagin, 2003). The study of Broidy (Broidy et al., 2003) for example compared data from 6 sites and 3 countries to examine the developmental course of physical aggression in children up from school entry up to early adolescence. At each of the sites a three or four group model best represented pathways of physical aggression. In the longitudinal birth cohort study of Dunedin, evidence was found for the existence of four trajectories of externalizing behavior: a life-course persistent, adolescent onset, childhood limited and low trajectory group (Moffitt, Caspi, Harrington, & Milne, 2002; Odgers et al., 2007; Odgers et al., 2008).

Differences in outcome measures and precursors have been found for these different pathways. The worst outcome measures regarding psychopathology and physical health have consistently been found for children in a chronic high trajectory, followed by children in an adolescent-onset trajectory. Children in a chronic low trajectory have been found to have the lowest levels of psychopathology in later life. Furthermore, children in a chronic high trajectory can be distinguished from children in other trajectories by their childhood histories of neuro-cognitive problems, inadequate parenting, severe hyperactivity and difficult temperament (Moffitt & Caspi, 2001; Odgers et al., 2007; Odgers et al., 2008). These differences in outcome measures and precursors strengthen the assumption that separate pathways for externalizing behavior indeed exist.

When investigating the trans-generational associations between parental externalizing problems and offspring problem behavior, comparing parental behavior and offspring behavior at one point in time may give an incomplete picture because associations between

parent and offspring problem behavior may be different across subpopulations of parents with different developmental pathways of externalizing behavior. In the present study we will investigate whether parental trajectories of externalizing problems during childhood predict levels of offspring externalizing and internalizing problems. The Zuid-Holland study is a community-based cohort study that followed 2076 participants in their behavioral development. We will determine externalizing trajectories of these participants for ages 4 to 18 years, and compute associations between these trajectories and internalizing and externalizing problems of the participants' offspring. To our knowledge, no previous study has examined the trans-associations between parental trajectories of externalizing problems and offspring externalizing and internalizing problems across generations.

Methods

Population and procedure

In this study we used data from the longitudinal Zuid-Holland study, a population-based study that started in 1983. A random sample of 2600 children and adolescents from 4 to 16 years of age was drawn from municipal registers of the Dutch province of Zuid-Holland which encompasses both urban and rural areas. Parents completed the Child Behavior Checklist (CBCL) on the behavior of their child. Of the 2447 parents reached, 2076 (85%) provided usable information about their children. After the first measurement in 1983 (time 1), the sample was approached again in 1985 (time 2), 1987 (time 3), 1989 (time 4), 1991 (time 5), 1997 (time 6) and 2007 (time 7). For details on the initial data collection, see Verhulst et al.(Verhulst, Akkerhuis et al., 1985).

For the 7th measurement, all participants, now aged 28 to 40, were contacted between January 2006 and July 2007, except for 23 who had deceased, 10 who were intellectually disabled and 264 who could not be traced. Usable information was provided by 1365 participants (66%). We used logistic regression to investigate if demographic characteristics were associated with participation at time 7. Participants at time 7 were more likely to be female (of all participants at T1 70% of the females and 62% of the males participate at T7; OR: 1.39, $p<.01$), younger (mean age at baseline was 10.2 years for non-participants and 9.8 years for participants; OR: .96, $p<.01$), and to have a higher SES (3.4 for non-participants and 3.7 for participants; OR: 1.13, $p<.01$). They also had a lower score on externalizing behavior at the first measurement than non-participants (participants 7.2 and non-participants 8.3, OR: 98, $p<.05$). In addition to providing information about their own behavior, all participants with children of 18 months or older were requested to fill out a questionnaire on their children's behavior. In this paper, the first generation participants are referred to as 'G1' (Generation 1) and their children as 'G2' (Generation 2).

Of the 1365 G1 participants in the seventh wave of the Zuid-Holland Study, 775 (54%) had a total of 1407 children. Participants with children were compared to participants without children by using logistic regression. Participants with children tended to be older (mean age at baseline was 11.4 for participants with children and 8.8 for participants without children, OR: 1.24, p<.01), female (of all participants 48% of the females and 31% of the males have children, OR: 2.30, p<.01) and to have a lower SES (3.4 for participants with children and 3.8 for participants without children, OR: .83, p<.01) than participants without children. Depending on the age of the G2 children, the CBCL/1,5-5 or the CBCL/6-18 was used. A total of 536 G1 participants (N G1 males = 186, N G1 females = 350) filled out usable questionnaires on a total of 939 G2 children aged 1.5 to 18 years. Of these 536 G1 participants, 225 had only one child; the other 311 G1 participants had two or more children. The mean age of the G2 children was 5.8 years.

Instruments

Child Behavior Checklist

The CBCL is a rating scale for parents to assess behavioral and emotional problems of children. All versions of the CBCL can be scored on 2 broad-band groupings of syndromes: Internalizing and Externalizing. Good reliability and validity of the CBCL have been replicated for the Dutch translation (Verhulst et al., 1996). For the first 5 measurements, the CBCL/4-16 was used to assess externalizing behavior of the G1 parents. For the G2 children at the 7th measurement the CBCL/1,5-5 (Achenbach & Rescorla, 2001a)and CBCL/6-18 (Achenbach & Rescorla, 2001b) were used. To make the CBCL version for pre-school children comparable to the version for school-age children, we divided the Internalizing and Externalizing scores of the pre-school children by the number of items on the scales, and multiplied the outcome by the number of items on the Internalizing and Externalizing scales of the school-age version.

G1 SES

G1 SES was scored on a five-step Standard Classification of Occupations according to parental occupational and educational level (CBS, 2001).

Statistical analyses

G1 externalizing trajectories

To determine the trajectories, information from waves 1 to 5 was used. All children who were at any of the 5 assessment points between 4 and 18 years were included in this study (Table 6.1). A completed CBCL from at least two assessment waves was available for 77.1% of the children, a completed CBCL from at least three waves was available for 68.3% of the children,

Table 6.1 Number of males and females by wave of measurement

	Wave 1 (1983) 4-16 years			Wave 2 (1985) 6-16 years			Wave 3 (1987) 8-18 years			Wave 4 (1989) 10-18 years			Wave 5 (1991) 12-18 years		
cohort	Age	M	F	Age	M	F	Age	M	F	Age	M	F	Age	M	F
1	4	81	84	6	69	64	8	69	71	10	72	76	12	71	75
2	5	78	90	7	65	73	9	65	75	11	70	73	13	69	73
3	6	78	83	8	63	71	10	65	70	12	65	71	14	68	74
4	7	89	85	9	67	72	11	65	71	13	67	74	15	66	71
5	8	81	83	10	66	62	12	77	64	14	72	69	16	67	65
6	9	78	78	11	66	72	13	60	71	15	67	73	17	62	67
7	10	78	83	12	59	63	14	59	67	16	64	69	18	60	66
8	11	77	83	13	65	66	15	66	69	17	62	72			
9	12	78	76	14	63	61	16	55	63	18					
10	13	78	83	15	52	65	17	43	51						
11	14	69	82	16	50	57	18	37	41						
12	15	75	70	17	1										
13	16	76	80	18											
total		1016	1060		686	726		661	713		539	577		463	491

M=males, F=Females

for 50.3% a completed CBCL was available from at least four waves and for 38.1 % a CBCL at all five waves was available.

We used Growth Mixture Modeling (GMM) (Muthén & Muthén, 2000; Muthén & Muthén, 1998-2007) to investigate which Externalizing trajectories would emerge among children aged 4 to18 years. The GMM analyses were conducted in Mplus, version 5. With GMM it is possible to identify latent classes of individuals with different Externalizing trajectories across age. Random effects represent the within-class variation in GMM.

Externalizing problems were assessed at five time points, covering 4 to 18 years. We estimated multiple models to determine the optimal number of trajectories. For determining the model fit, we used both the BIC value and the Loh-Mendell-Rubin likelihood ratio test (LMR-LRT) (Jung & Wickrama, 2007; Lo et al., 2001). We evaluated the BIC values, according to the guidelines by Raftery (1995): if the difference in BIC values for two models is larger than two, we consider the model with the smallest BIC to be a better model. The LMR-LRT compares the fit of the current model with a model that has one class less. A significant test value indicates that the current model is preferred above the model with one class less. Therefore, when choosing our final model we decided to choose the model that has the lowest BIC value but still has a significant LMR-LRT statistic. The entropy is a measure of classification accuracy that gives us additional information about how precise the model has assigned each individual to his or her most likely class. entropy values range from 0 to 1 with 1 indicating greater precision.

Sex differences in G1 trajectories

To see if the number and profiles of the trajectories found in step 1 held for males and females, a loglikelihood difference test was performed(Muthen & Muthen). For this purpose, a multiple-group analysis was performed first. Based on our final model, two multiple-group analyses with grouping variable sex were carried out. In the first model we constrained the intercepts, linear and quadratic slopes of each trajectory to be equal across males and females. In the second model the intercept, linear and quadratic slopes of each trajectory were allowed to be different across males and females. Next, a loglikelihood difference test between the two models was computed. If the loglikelihood difference test is not significant, this means that equality constrains do not worsen the fit of the model and the model with no differences between males and females is preferred. If the loglikelihood difference test is significant, the model with the best fit is preferred, which is the unconstrained model.

Prediction of offspring externalizing and Internalizing Problems.

The SPSS Mixed procedure was used to investigate whether G1 Externalizing trajectories predicted G2 child Internalizing and Externalizing problems. We used multilevel analyses (Boyle & Willms, 2001) to account for the within family clustering, because 49% of the G1 participants had two or more participating children. In these analyses, the G1-trajectories were represented by a multiple-category independent variable. In each model, G2 sex, age of G1 and G2 and G1 SES were included as confounders. Interactions of G1 trajectories with G1 and G2 sex were tested to see if the sex of parent or child modified the effect of the G1 trajectories on G2 problem behavior.

Results

Identifying trajectories of externalizing behavior

As a first step, we tried to identify the optimal number of Externalizing trajectories of G1 participants. Test statistics can be found in Table 6.2. The BIC value of the 4-class model (41012.6) was lower than the BIC value of the 3-class model (41204.9), the 2-class model (41458.7) and the 1-class model (45089.5). The LMR-LRT test statistic of the 4-class model was significant. Although the BIC values of the 5-class model and 6-class model were lower than the BIC of the 4-class model, the LMR-LRT statistic was not significant in the 5-class model. It was significant in the 6-class model, but because the entropy was lower than it was in the 4-class model and the results were less interpretable, we decided to choose the 4-class model. Next, a multiple group analysis was conducted to determine whether the same model could be applied to males and females. The loglikelihood difference between the constrained model and the unconstrained model was significant ($\Delta\chi^2$ diff=72.56, df=12). The model with equal intercepts, linear and quadratic slopes for males and female had a worse loglikelihood

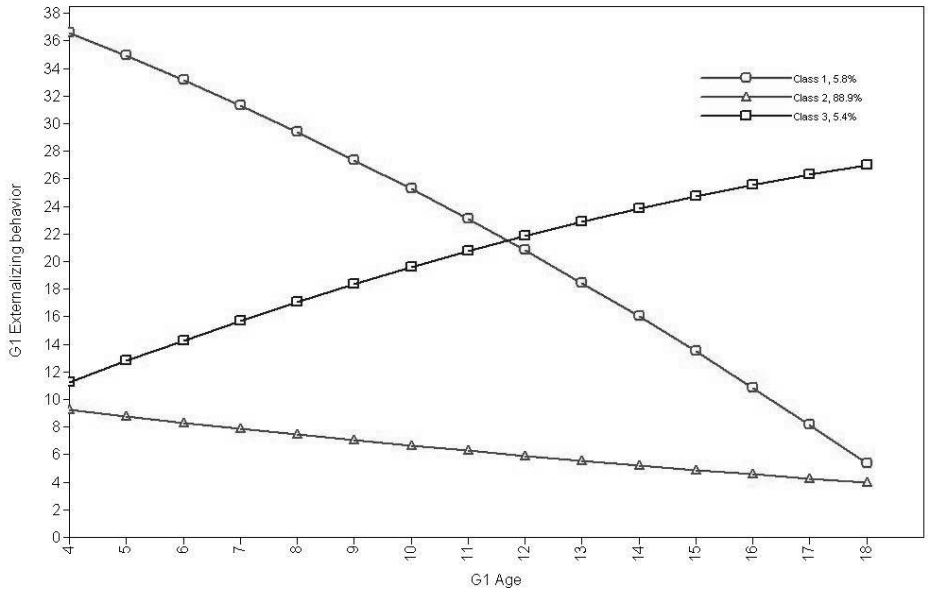
Table 6.2 Fit indices for general growth mixture models

G1 males and females	BIC	Entropy	LMR-LRT
1-class model	45089.5	-	-
2-class model	41458.7	.93	-20946.9
3-class model	41204.9	.92	-20618.6**
4-class model	41012.6	.89	-20472.6**
5-class model	40955.1	.85	-20389.0
6-class model	40896.2	.83	-20317.1*
G1 males			
1-class model	21080.4	-	-
2-class model	20852.9	.93	-10495.8
3-class model	20658.3	.91	-10346.8**
4-class model	20607.3	.88	-10235.7
5-class model	20563.2	.86	-10196.4
6-class model	20536.1	.87	-10160.5
G1 females			
1-class model	20937.9	-	-
2-class model	20706.4	.94	-10426.6
3-class model	20536.3	.89	-10273.1
4-class model	20434.8	.87	-10174.1*
5-class model	20380.5	.86	-10109.4
6-class model	20353.8	.84	-10068.3

*=p<.05,**=p<.01

(-21855.0) than the model in which intercepts, linear and quadratic slopes were allowed to differ for males and females (loglikelihood= -21810.0). Therefore, we chose to use separate

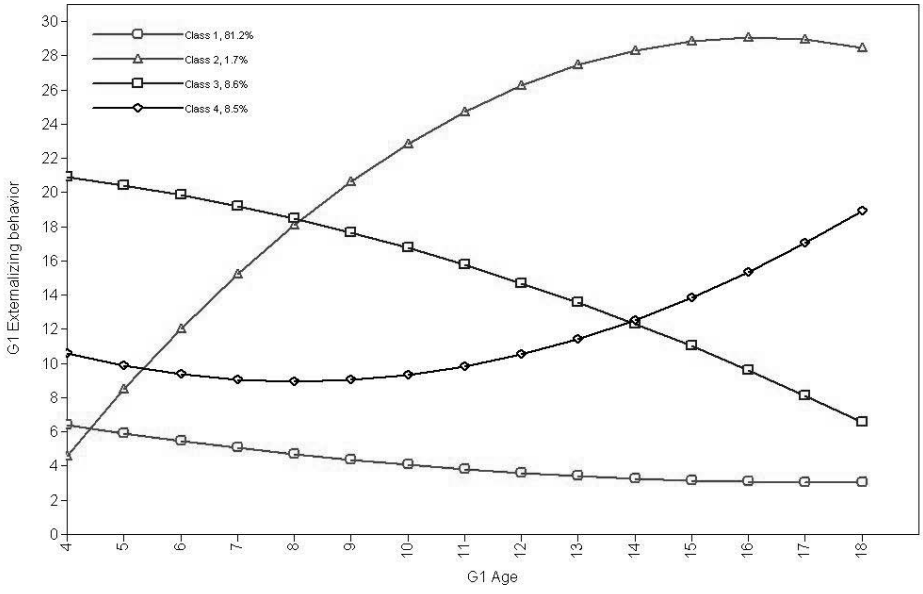
Figure 6.1 G1 Externalizing trajectories for males



models for males and females. Results of the GMM analyses for males and females can be found in Table 6.2. For males, the 3-class model had a smaller BIC (20658.4) than the 1- and 2-class models. The LMR-LRT statistic was also significant. Models with 4 to 6 classes had smaller BIC values but the LMR-LRT statistic was not significant in any of these models. Therefore, the 3-class model was chosen for males. The trajectories of this 3-class model are shown in Figure 6.1. The three classes can be described as follows. The first class comprises 5,8% of the G1 individuals. They start off at high levels of Externalizing problems but decrease rather steeply. When they are 18 years old, their levels of Externalizing problems have reached a low level. We denote this class the 'decreasing group'. The second class comprises almost 89% of the G1 individuals. Their levels of Externalizing problems are consistently low. We denote this class the 'low group'. The third class comprises 5,4% of the G1 individuals. They start off at a low level of Externalizing problems, but their Externalizing Behavior increases from age 4 on. At age 18, these individuals have reached a high level of Externalizing Behavior. We denote this class the 'increasing group'.

For females, The BIC of the 4-class model was lower than the BIC values of the models with fewer trajectories (20434.8). Although BIC values of the 5-class model and 6-class model were even lower, only the LMR-LRT statistic of the 4-class model was significant. Therefore, we chose the 4-class model as our best model for females (Figure 6.2). The four classes of this model can be described as follows. The first class consists of 81,2% of the individuals. These individuals follow a stable low trajectory. We denote this group the 'low group'. The second class comprises 1,7% of the individuals. These individuals start off low on External-

Figure 6.2 G1 Externalizing trajectories for females



izing Behavior, but their levels of Externalizing Behavior increase strongly during childhood. At age 18, they have reached a high level of Externalizing Behavior. We denote this group the 'increasing group'. The third class consists of almost 9% of the individuals. These individuals start off high, but their levels of Externalizing Behavior decrease slowly over time, until they have reached a rather low level at age 18. We call this group the 'decreasing group'. The fourth class comprises 8% of the individuals. These individuals have slightly elevated levels of Externalizing Behaviors at age 4, but their externalizing levels start increasing around adolescence. When they are 18 years old, their level of Externalizing Behavior is high, but not as high as the level of the increasing group. We denote this group the 'adolescent-increasing group'.

Using G1 externalizing trajectories to predict G2 externalizing behavior

The number of parents in each trajectory matched to G2 children is shown in Table 6.3. Because we found separate trajectories for males and females, the multilevel analyses for G1 males and females were also done separately.

Table 6.3 Number of children with fathers and mothers in trajectory class 1, 2, 3 and 4.

Trajectory class	Number of males (fathers) in Class:	Number of children with father in Class:	Trajectory class	Number of females (mothers) in Class:	Number of children with mother in Class:
Decreasing group	2 (1.1%)	5 (1.5%)	Low group	300 (85.7%)	545 (87.6%)
Low group	179 (96.2%)	301 (95%)	Increasing group	4 (1.1%)	7 (1.1%)
Increasing group	5 (2.7%)	11 (3.5%)	Decreasing group	22 (6.3%)	34 (5.5%)
			Adolescent increasing group	24 (6.9%)	36 (5.8%)
Total number of children	186 (100%)	317 (100%)	Total number of children	350 (100%)	622 (100%)

The results of the multilevel analyses for males are presented in Table 6.4. G1 male trajectories of Externalizing Behavior did not significantly predict levels of Externalizing and Internalizing behavior in offspring.

The results of the multilevel analyses for females are presented in Table 6.5. G1 female trajectories of Externalizing Behavior did predict levels of offspring Externalizing and Internalizing behavior. The adolescent-increasing group predicted elevated levels of offspring Externalizing Behavior, compared to the low group. The decreasing group predicted elevated levels of offspring Externalizing Behavior only in boys (mean boys: 18.24, mean girls: 6.34). In addition, the adolescent-increasing group predicted elevated levels of offspring Internalizing behavior.

Table 6.4 G1 male Externalizing trajectories as a predictor of G2 Externalizing and Internalizing behavior, results of the multilevel analyses

	Externalizing G2		**Internalizing G2**	
	Estimate	95% CI	Estimate	95% CI
Intercept	18.86**	14.34-23.38	3.89**	1.59-6.18
Male Decreasing group	-1.93	-9.58-5.73	-2.04	-5.94-1.85
Male Increasing group	-2.94	-8.49-2.61	-.38	-3.20-2.44
Male Low group	ref	ref	ref	ref
Sex G2	.42	-1.24-2.07	-.59	-1.43-.26
Age G1	-.04	-.38-.31	-.02	-.20-.15
Age G2	-.85**	-1.13--.57	.19*	.04-.33
SES	-.74*	-1.39--.10	.02	-.31-.35

*p=<.05, **p<.01

Table 6.5 G1 female Externalizing trajectories as a predictor of G2 Externalizing and Internalizing behavior, results of the multilevel analyses

	G2 externalizing		**G2 internalizing**	
Trajectory class	Estimate	95% CI	Estimate	95% CI
Intercept	17.88**	14.52-21.25	4.05**	2.11-5.99
Female Adolescent increasers	5.04*	.82-9.26	2.68**	.83-4.52
Female Increasing group	.62	-9.86-11.10	-.60	-5.13-3.94
Female Decreasing group	-2.89	-7.82-2.04	1.93	-.01-3.86
Female Low group	ref	ref	ref	ref
Sex G2	1.24	-.12-2.60	-.21	-.97-.56
Age G1	-.28*	-.55--.02	-.09	-.25-.06
Age G2	-.81**	-1.02--.59	.30**	.17-.43
SES	-.12	-.59-.34	.07	-.20-.34
G2Sex*adolescent increasing group	.49	-5.25-6.22		
G2Sex*increasing group	-2.86	-16.60-10.88		
G2Sex*decreasing group	10.66**	4.81-16.52		

* p=<.05, **p<.01

Discussion

In this study, we investigated the association between trajectories of parental externalizing behavior and the level of their offspring's externalizing and internalizing behavior. Data were collected in a multi-cohort longitudinal community-based study. G1 trajectories were specified for the development of externalizing problems in 4-18 year old individuals. Separate trajectories for males and females were determined. The differences between trajectories for males and females are in line with previous findings. Previous studies found differences in level, shape and the optimal number of trajectories for male and female externalizing behavior (Broidy et al., 2003). These studies strengthen our own findings and our choice to use separate trajectories for males and females.

The trajectories for males did not predict the level of offspring's problem behavior. In contrast, female trajectories did. The adolescent-increasing group predicted elevated levels of offspring externalizing and internalizing behavior. The decreasing group predicted elevated levels of offspring externalizing behavior only in boys.

Our first important finding is that female externalizing trajectories differentiated between levels of internalizing and externalizing problems for offspring. This means that mothers with different childhood developmental trajectories of externalizing behavior predicted offspring problem behavior in different ways. This result indicates that when investigating the intergenerational transmission of externalizing behavior from mothers to their offspring, the assessment of maternal externalizing behavior at only one time point may provide insufficient information.

Associations between the G1 maternal adolescent-increasing trajectory and G2 offspring behavior may exist because individuals on the adolescent-increasing trajectory have worse outcomes in adulthood. The results of previous research have shown that individuals on adolescent-onset externalizing trajectories are more likely to suffer from substance use and economic problems at age 32, than individuals following low trajectories (Odgers et al., 2008). These factors form risk-factors for the behavioral development of the child (Serbin & Karp, 2004) and may have impact on offspring externalizing as well as internalizing behavior (Bailey et al., 2006; Bradley & Corwyn, 2002). Thus, the mothers in the adolescent-increasing group may have influenced their offspring's problem behavior through their own problem behavior in adulthood. However, this cannot be the only mechanism behind the associations that we found in our study. For instance, individuals who follow a decreasing trajectory have not been shown to have worse outcomes as adults (Odgers et al., 2008), but still this trajectory predicted elevated levels of boys' externalizing behavior.

Another possible explanation is that the child inherits the trajectory of its parent. Results from behavioral genetic studies showed a genetic contribution to stability and change in problem behavior (Bartels et al., 2003; van der Valk et al., 2003). This means that, when a child inherits genes from its parent, the development of externalizing behavior may show a similar pattern for parent and child. In the present study, the offspring of mothers in the decreasing group would start off at a high level of externalizing behavior, and decrease during childhood and adolescence. In the same way, the offspring of adolescent-increasing mothers would start off at a low level of externalizing behavior, and increase during adolescence. However, we will only be able to test the hypothesis that parents and their children follow the same trajectories when we have followed both parents and their children in their development. It will be a challenge for future research to collect the data needed to compare the trajectories of parents with the trajectories of their offspring.

It is also possible that different mechanisms lie behind the associations between different trajectories and offspring problem behavior. Perhaps the association between the adolescent-increasing trajectory and offspring internalizing problems can be explained by

the adult problems of the mother, whereas the association between the maternal decreasing trajectory and boys' externalizing behavior can be explained by the inheritance of the maternal trajectory.

It is interesting that the maternal decreasing trajectory only predicted externalizing behavior of boys. As we stated before, it may be that a decreasing trajectory is inherited. However, it is not clear why only boys would inherit their mothers' externalizing trajectory. In contrast, some studies find that genetic factors are more important in the development of externalizing behavior for girls than for boys (Cadoret & Cain, 1980; D'Onofrio et al., 2007). Therefore, the present results should be replicated and the trajectory inheritance hypothesis should be tested in future research.

It is surprising that we did not find associations between the maternal increasing trajectory and offspring problem behavior. A previous study investigating the adult outcomes of children with externalizing trajectories found that children with high levels of antisocial behavior throughout childhood experienced significant mental health, physical health, and economic problems at age 32 (Odgers et al., 2008). Thus, in the present study we expected that especially this group of mothers would influence the environment of the offspring in a negative way. Because the outcome of this trajectory was even worse than the outcome of the adolescent-increasing trajectory (Odgers et al., 2008), we expected that the associations between the increasing group and offspring behavior would be even stronger than the associations between the adolescent-increasing group and offspring behavior. In our study, there may have not been enough power to discover the effect of the increasing trajectory on offspring externalizing behavior. We would therefore recommend the use of a larger sample in future studies, to investigate whether the present results can be replicated.

In contrast to the maternal trajectories of externalizing behavior, the paternal trajectories did not predict their offspring's externalizing behavior. This result could mean that the developmental course of paternal externalizing behavior is just not a good predictor of offspring behavior. Previous studies found associations between paternal externalizing behavior in childhood, adolescence and adulthood, and offspring behavior. Because of the findings with regard to maternal trajectories, it would make sense that paternal trajectories are associated with offspring behavior as well. Some methodological explanations should be considered that might explain the lack of results for paternal trajectories. First, trajectories for paternal externalizing behavior were determined using information mostly provided by mothers. In 1983, 89% of the G1 children were rated by their mothers. In 2006, the G1 boys who are now fathers (N=186) rated their G2 children, and G1 girls who are now mothers (N=350) rated their G2 children. When analyzing the associations between G1 maternal trajectories and G2 offspring behavior, the G1 maternal externalizing behavior is rated by mothers, whereas G2 offspring behavior is rated by mothers as well. However, when analyzing the associations between G1 paternal trajectories and G2 offspring behavior, the G1 paternal externalizing behavior is rated by mothers, whereas G2 offspring behavior is rated by fathers. Previous

research has shown that there are discrepancies between the ratings of different informants, and that the agreement between ratings of mothers and fathers is moderate (Achenbach, McConaughy, & Howell, 1987; Duhig, Renk, Epstein, & Phares, 2000). Perhaps associations between fathers and their offspring have not been found because G1 child behavior and G2 child behavior were not rated by similar informants. Second, the group of fathers that participated in the present study was considerably smaller than the group of mothers. There were almost two times more mothers than fathers in this study. For this reason, fathers in the increasing and decreasing trajectories were scarce. There were no significant results, but the analyses possibly did not have enough power to conclude that paternal trajectories of externalizing behavior do not predict offspring externalizing behavior. Research with larger samples is needed to investigate the associations between male externalizing trajectories and offspring externalizing behavior.

Of the original 2076 participants, 1365 were willing to participate in the 7th measurement, and therefore, a selection bias could have appeared. We do not know how many of the participants not included in the 7th measurement have children and we do not know anything about their current mental health, or the health of their children. Our analyses indicated that participants in the 7th measurement wave were more likely to have had lower externalizing levels at the first wave. It is therefore possible that a group of participants with higher levels of externalizing behavior dropped out, but we cannot deduce if this attrition would have had an effect on the externalizing trajectories specified in the present study and the impact of these trajectories on offspring externalizing behavior. Furthermore, the number of participants in deviant trajectories was quite small. Also, the number of G1 females in the present analyses was two times as large as the number of males. Future studies need larger sample sizes for males and females to replicate the present analyses.

Despite these limitations, the present study has some major advantages. With our study design, two generations of child behavior were assessed prospectively in a relatively large sample. G1 trajectories have been specified out of measurements at five time points and cover the whole childhood-adolescence age range. Similar instruments have been used for the assessment of G1 child behavior and offspring child behavior, which makes comparisons justified.

In the present study, we used trajectories of parental externalizing problems to predict offspring problem behavior. In our study, maternal trajectories of externalizing behavior predicted levels of offspring internalizing and externalizing behavior whereas paternal trajectories did not. Our results indicate that associations between the development of externalizing behavior of mothers and their offspring's problem behavior differ across maternal trajectories of externalizing behavior. When the developmental course of maternal externalizing behavior is not considered, one should be cautious in drawing conclusions about the effect of parental psychopathology on offspring behavior problems. The assessment of maternal externalizing behavior at only one time point may provide insufficient information. However,

because the number of participants in the deviant trajectories is small, it is necessary to retest the associations between parental antisocial trajectories and child problem behavior using a larger sample. Second, it is important to elaborate on these findings. It will be a challenge to investigate why different developmental courses lead to different offspring outcomes, and what the mechanisms are behind the associations between the parental trajectories and offspring problem behaviors.

Chapter 7

General Discussion

In the present study, we investigated intergenerational transmission of child problem behavior, using information collected in a longitudinal, population-based study on 2 generations of children over a period of 24 years. Three main research questions were addressed in this thesis: 1) To what extent do different types of problem behaviors continue across generations? 2) What role do current parental problem behavior and parenting play in the intergenerational transmission of child problem behavior? 3) Do parental trajectories of internalizing and externalizing problem behavior predict offspring internalizing and externalizing behavior?

The results of the present study will be discussed below, followed by a description of the strengths and limitations, and implications for future research.

Intergenerational transmission of child problem behavior

In the second chapter of this thesis, the intergenerational transmission of eight different child problem behaviors was investigated. We tested whether problem behavior of parents in their childhood (N=271) predicted the problem behavior of their offspring (N=437) in childhood.

The CBCL syndrome scales Anxious/Depressed, Withdrawn, Somatic Problems, Social Problems, Attention Problems, Delinquent Behavior and Aggressive Behavior of parents in childhood were all associated with similar problem behaviors in offspring. Only Thought Problems was not transmitted across generations. Furthermore, we have indications that the transmission of these syndromes is rather specific. Most syndromes were more likely to be transmitted to the similar syndrome in the next generation, than to other syndromes.

Although the results of a few previous studies indicated the existence of intergenerational transmission of child behavior (Cohen et al., 1998; Serbin et al., 1998), a structural investigation of a broad range of different problem behaviors was never done before. Most previous studies were not able to compare transmission of different types of behavior, or draw conclusions about the specificity of the transmission because they only compared one type of behavior in two generations, and because the instruments and assessment procedures often differed between generations.

Even though we did not test for mechanisms through which child problem behaviors are transmitted, knowing that these behaviors do continue across generations is important as well. Having a parent that exhibited problem behavior as a child is a risk factor for the offspring, and should definitely be taken into account by clinicians when investigating the risk of a child to develop problem behavior.

The roles of parental psychopathology and parenting

In chapters 3 and 4, the roles of parental psychopathology and parenting in the intergenerational transmission of child internalizing and externalizing behavior were examined.

The role of parental psychopathology versus parenting in the intergenerational transmission of child behavior

In chapter 3, we investigated whether parenting and parental psychopathology mediated the intergenerational transmission of child internalizing and externalizing behavior.

The results showed that current parental psychopathology was a full mediator in the relationship between child problem behavior of the parent and offspring problem behavior. In other words, child problem behavior of parents predicted current parental psychopathology, and current parental psychopathology predicted offspring problem behavior. Parenting was no mediator in the relationship between child problem behavior of parents and offspring problem behavior. However, parenting was a partial mediator in the relationship between parental psychopathology and offspring behavior. Parental psychopathology predicted parenting, and parenting in its turn predicted offspring problem behavior. Parental psychopathology still predicted offspring problem behavior significantly after parenting was taken into account. These results were similar for internalizing and externalizing behavior. We can conclude that current parental psychopathology played a direct role in the intergenerational transmission of child problem behavior, whereas parenting played an indirect role.

Our results are not in line with the results of the only previous study testing the role of parenting and parental psychopathology simultaneously. In this study (Kaplan & Liu, 1999), only parental psychopathology played a significant role in the intergenerational transmission of externalizing behavior in adolescent girls. The role of parenting became insignificant when both parenting and parental psychopathology were simultaneously used to predict the externalizing behavior of the adolescent daughters. Similar to our study, the transmission effect of parental psychopathology was apparently stronger than the effect of parenting. However, in the study of Kaplan and Liu (1999), parenting did not play a role in the intergenerational transmission of parenting anymore whereas in our study, parenting and parental psychopathology both predicted child behavior. We must note that the study of Kaplan and Liu (1999) only examined two generations of adolescent girls. Their results may therefore not be generalized to boys or to younger children.

In this study we have focused solely on two environmental factors, parenting and parental psychopathology. Other environmental factors may play a role in the intergenerational transmission of child behavior as well. For example peer relationships and school commitment are found to be important in the development of conduct disorder (Simons, Johnson, Conger, & Elder, 1998) . Since these factors may play a role in the intergenerational transmission of child problem behavior they should be considered in future research.

The role of intergenerational transmission of parenting in the intergenerational transmission of behavior

In chapter 4, we investigated whether parenting was transmitted across generations as well, and what role the transmission of parenting played in the intergenerational transmission of externalizing behavior. The results of previous studies differed, mainly in how parenting was transmitted across generations. A distinction has been made between direct and indirect transmission of parenting. Direct transmission indicates the existence of social learning of parenting. Indirect transmission of parenting arises when poor parenting affects the behavioral and emotional development of the children (Belsky, 1984; Feinberg et al., 2007; Galambos et al., 2003; Shaw et al., 1998). When these children grow up they are likely to still experience behavioral and emotional problems (Caspi et al., 2003; Hofstra et al., 2000), and their adult behavioral and emotional problems are in their turn associated with a poor parenting style (Johnson et al., 2001; McCord, 1999).

Some studies confirmed the existence of both the direct and the indirect transmission of parenting behavior. Capaldi et al. (2003) found that direct and indirect transmission of parenting predicted the level of externalizing behavior in children, and Thornberry et al. (2003) found a direct transmission of parenting to daughters and an indirect transmission of parenting through externalizing behavior to sons. Some studies however, only found one of the two pathways of parenting transmission: Hops et al. (2003) found that the transmission of parenting was indirect,i.e. it was fully mediated by the aggressive behavior of the parent. Conger et al. (2003) however, found only a direct transmission of parenting.

Because in previous studies the construct parenting often included different parenting dimensions, this may have led to dissimilar results (Dubow et al., 2003). We decided to study the parenting dimensions rejection and overprotection separately.

The results showed that not only did parenting play a role in the intergenerational transmission of child problem behavior; it was transmitted across generations itself as well. However, it was transmitted through different mechanisms. We found that overprotection was transmitted across generations directly. It therefore appears that overprotection is transmitted through social learning. When social learning takes place, children are exposed to the parenting of their parents, and copy this parenting when they have children themselves. The direct transmission of parenting behavior was found in several previous studies(Capaldi et al., 2003; Conger et al., 2003). In our study, rejection was transmitted indirectly as well, through adult externalizing behavior. Indirect transmission of parenting was supported by several studies as well (Capaldi et al., 2003; Hops et al., 2003; Thornberry et al., 2003). Because we found only direct transmission of overprotection and indirect transmission of rejection, our research shows that it is important to treat different parenting dimensions as separate constructs when doing intergenerational research, because they seem to play different roles in the intergenerational transmission of behavior.

Trajectories of child internalizing and externalizing behavior and their associations with offspring internalizing and externalizing behavior.

In chapter 5 and 6, we examined the associations between the development of parental internalizing and externalizing behavior in childhood, and offspring problem behavior. We determined the trajectories with General Mixture Modeling, using information from waves 1 to 5. All children who were at any of the five assessment points between 4 and 18 years were included in this study. We then used multilevel analyses to investigate whether the parental trajectories predicted offspring internalizing and externalizing behavior. The analyses showed that parental trajectories of internalizing and externalizing behavior indeed predicted levels of offspring internalizing and externalizing behavior. The increasing as well as the decreasing trajectory of internalizing problems predicted elevated levels of offspring internalizing behavior, whereas only the decreasing female trajectory predicted elevated levels of offspring externalizing behavior. With regard to externalizing trajectories, we had to specify different trajectories for males and females. The male trajectories did not predict offspring externalizing and internalizing behavior. Of the female trajectories, the adolescent-increasing trajectory predicted elevated levels of both offspring internalizing and externalizing behavior. The decreasing trajectory only predicted elevated levels of offspring externalizing behavior in boys.

The results of these analyses indicate that developmental pathways of internalizing and externalizing behavior distinguish between levels of offspring's problem behavior. With regard to parental trajectories of internalizing problems, the increasing as well as the decreasing trajectory predicted elevated levels of internalizing problems. For trajectories of externalizing behavior, female adolescent-increasing and decreasing trajectories predicted elevated levels of offspring externalizing behavior. So, we found that parents in both increasing and decreasing trajectories put their children at risk for developing problem behavior. This implies that when parental behavior is only measured at one time point, associations between parental internalizing problems and offspring internalizing problems may be missed. Thus, these results suggest that it may not be enough to compare the behavior of parents in childhood with the behavior of their children, like we did in chapter 2, when we aim to find all associations between parental problem behavior and offspring problem behavior.

Intragenerational continuity of problem behavior may be the explanation for the associations between the increasing trajectories of internalizing and externalizing problems, and offspring problem behavior. Several studies have found that individuals who follow increasing trajectories during childhood have worse adult-outcomes (Dekker et al., 2007; Odgers et al., 2008). As described earlier, adults showing problematic behavior are known to provide their children with an unfavorable environment and the unfavorable environment in its turn will affect the well being of their offspring. In this way, the increasing trajectories of internalizing and externalizing behavior may be associated with elevated levels of offspring problem behavior.

However, the associations between decreasing trajectories and offspring problem behavior are unlikely to be explained in this way, because decreasing trajectories do not have significantly worse adult-outcomes than chronic low trajectories (Dekker et al., 2007; Odgers et al., 2008). The associations between decreasing trajectories of internalizing and externalizing behavior, and offspring problem behavior may have a genetic explanation. The child may inherit the trajectory from its parents. Results from behavioral genetic studies have indeed shown a genetic contribution to stability and change in problem behavior (Bartels et al., 2004; van der Valk et al., 2003). If a child inherits its parents' genes, the developmental pathways of parent and child may show a similar pattern. This mechanism may explain the associations between both the decreasing trajectories of internalizing and externalizing problems with offspring internalizing and externalizing problems, but it may also explain the associations between the increasing trajectories and offspring problem behavior.

We did not find associations between paternal externalizing trajectories and offspring problem behavior. We also did not find a relation between the maternal increasing externalizing trajectory and offspring problem behavior. This lack of results may be due to methodological difficulties. First, we had fewer fathers in the sample than mothers, and there were only few fathers in the deviant externalizing trajectories. The same holds for the mothers in the increasing externalizing trajectory: only 5 mothers followed this trajectory. It is well possible that we did not have enough parents in the deviant trajectories to find the associations between the trajectories of the fathers, the increasing trajectory of the mothers and offspring problem behavior. Informant differences may also explain the lack of results for the parental trajectories. Trajectories for paternal externalizing behavior were determined using information mostly provided by mothers. In 1983, 89% of the G1 children were rated by their mothers. In 2006, the G1 boys who are now fathers (N=186) , rated their G2 children, and G1 girls who are now mothers (N=350) rated their G2 children. When analyzing the associations between G1 maternal trajectories and G2 offspring behavior, the G1 maternal externalizing behavior is rated by mothers, whereas G2 offspring behavior is rated by mothers as well. However, when analyzing the associations between G1 paternal trajectories and G2 offspring behavior, the G1 paternal externalizing behavior is rated by mothers, whereas G2 offspring behavior is rated by fathers.

Overall conclusions

In the present study we have investigated to what extent transmission of different types of child behavior occurs across generations, we have examined the way in which this transmission occurs, and the factors that are of importance with regard to this transmission. We have focused on a new dimension of intergenerational research by investigating the associations of behavioral development of the parent in childhood with offspring problem behavior.

We have found that almost every type of child problem behavior is transmitted from parents to their children. Furthermore, the results of our studies suggest that child problem behavior, adult psychopathology and parenting are all related to each other and that they are all related to the intergenerational transmission of child behavior. These factors support each other's existence. In fact, there is no real starting point to the cycle of intergenerational transmission. Every single factor has a direct influence on one or more of the other factors, and, as a consequence, it has an indirect influence on all other factors in the cycle. Although we found that only parental psychopathology plays a direct role in the intergenerational transmission of child problem behavior, our results suggest that poor parenting, which is associated with parental psychopathology, enhances the intergenerational transmission of child behavior. Even in the absence of parental psychopathology, overprotective parenting may be transmitted directly, which increases the possibility that a child develops problem behavior. When treating child problem behavior it is therefore important to treat parental psychopathology simultaneously, and to coach parents' parenting practices. To improve the child's well being and to limit the extent to which intergenerational transmission takes place, it is important to focus on all these factors simultaneously.

In addition, our research on trajectories has shown that even parental problem behavior in childhood that does not evolve into adulthood, may be a predictor for offspring problem behavior. This result suggests that adult problem behavior and parenting are not the only factors that play a role in the intergenerational transmission of problem behavior. Genes are likely to play an important role in the intergenerational transmission of child behavior, and may explain the associations of parental trajectories of problem behavior with elevated levels of child problem behavior. We know from behavioral genetic studies that a substantial part of behavioral variation is explained by genetic factors (Bartels et al., 2004; van der Valk et al., 2003). However, genes were not a focus of the present study and the precise role of genes in the intergenerational transmission of behavior should therefore be explored in future research on intergenerational transmission of behavior.

Strengths and weaknesses

Despite the strong design, certain limitations of the present study should be mentioned. First, as in every study that assesses people at multiple time points, attrition has taken place. In 24-year follow-up participants are lost due to death, because they are untraceable or because they refuse to participate anymore. In a study like this, with a community based sample, we should be aware that the participants with the worst adult outcomes will probably be the first to refuse or the most difficult to keep track with (Serbin & Karp, 2004). The results of high-risk people may be different from the results that we have found in our study, and may be visible more clearly within a high- risk sample.

Cairns (Cairns et al., 1998) provided three criteria for an intergenerational research design. First, information should be prospective rather than retrospective. Second, data should be obtained from multiple informants or measurement sources. Third, individuals in both generations should be observed at the same age or developmental stage. Our study satisfies the first criterion perfectly; we collected prospective information in both parents and children. The second criterion was not satisfied: we did not use multiple informants or multiple measurement sources in the present study. It is true that the use of multiple informants and measurement sources could have given us more information about the intergenerational transmission of behavior. When intergenerational transmission can be observed when using other informants than parents, and using other measurement sources than questionnaires, this would be an even stronger indication for the existence of intergenerational transmission of behavior. Our main informants for assessing the behavior of children have been parents. For rating G1 child problem behavior, the parents of G1 participants were used as informants and for rating G2 problem behavior, the adult G1 participants were used. Thus, different informants were used for rating two generations of child problem behavior, which can be considered a strength. However, for both generations of children, we did not use teacher reports or self-reports as measures of child behavior. Furthermore, at time 7 the G1 participants provided the information on the behavior of their children as well as their own problem behavior in adulthood, and their parenting behavior. It would have been better if we had multiple informants providing this information. With regard to the sources of information, we used questionnaires to gain our information. It would have been useful to have home-observations, or diagnostic interviews with the children as well.

The third criterion, measuring parents and their children at the same age or developmental stage, was partly satisfied. It is best to assess parents and children at the same age, or at an age as close to each other as possible. In this way, the developmental stages of parent and child are comparable, and there is a better chance that we will detect similarities between parent and child when they are indeed present. When all 939 G2 children of the present study are taken into account, the mean difference between the age of parent at the first assessment and the age of the offspring at its assessment was about six years. This means that some children are indeed assessed at the same age that their parents were assessed, but that other children and their parents differ in the age at which they were assessed. The intergenerational transmission that we found in our study may even have been stronger when the age of assessment between parents and their offspring would have been closer together.

We have investigated whether internalizing trajectories predict internalizing offspring behavior, and whether externalizing trajectories predict internalizing behavior. In the same way, we predicted externalizing behavior from parental externalizing and internalizing trajectories. We also theorized that co-developing externalizing behavior may be an explanation for the associations we found between the decreasing internalizing trajectory of mothers and externalizing behavior in offspring. However, we did not use internalizing and externalizing

trajectories as simultaneous predictors, which can be seen as a limitation of our study. From previous research we know that internalizing and externalizing problems often codevelop (Gilliom & Shaw, 2004; Keiley et al., 2000). Perhaps combinations of specific internalizing and externalizing trajectories contribute to the level of offspring internalizing and externalizing behavior as well. By separating internalizing from externalizing trajectories, we suggest that they each operate in their own way, uninfluenced by each other. This is probably not the case. However, by combining specific trajectories with one another, the sizes of our groups would have become too small to use for regression analyses.

A last limitation is our use of broad-band scales in chapter 3,4,5 and 6. Because we only focused on the broad-band scales of internalizing and externalizing behavior, we do not know whether results of our analyses for emotional problems like anxiety or behavioral problems like aggression would have been the same as for the broad-band problem scales to which they belong. However, by focusing on the broad-band scales, we have found a general indication of how child behavior is transmitted across generations.

Despite these limitations, the present study is a unique study, with a strong design. We have collected information on child behavior in two successive generations, with a follow-up time of 24 years. The sample size is relatively large: 536 of the children who were assessed in 1983 became the parents of 939 children who were included in the study in 2006. Because both sexes were included in our sample we were able to look at sex differences. In contrast to existing studies that examined the intergenerational transmission of child behavior (Cairns et al., 1998; Cohen et al., 1998; Serbin et al., 1998), we assessed a wide range of problem behaviors in both generations of children. Therefore we were able to compare the intergenerational transmission of different types of problem behavior. A final advantage of the present study is the use of similar instruments in both generations. Most studies on intergenerational transmission of behavior have not been able to use similar instruments in both generations because many instruments become outdated after several years. Because the Child Behavior Checklist has been used in the Netherlands for over 24 years now, and has only changed marginally, we were able to use the same instrument in both generations of children.

Implications for future research

The results of the present study have provided evidence for the existence of intergenerational transmission of child problem behavior. Different types of child problem behavior were transmitted across generations. Parental psychopathology in adulthood, and in an indirect way parenting behavior seem to function as mechanisms within the intergenerational transmission of child problem behavior. An individual's developmental path of problem behavior in childhood and adolescence played a role as well in the development of problem behavior in the next generation.

Although we have tested the intergenerational transmission of problem behavior in 3 broad-band scales and 8 subscales, we tested the mechanisms and the trajectories only for the broad-band scales Internalizing and Externalizing behavior. By using the broad-band scales, we aimed to captured the general effect of an internalizing or externalizing disorder in childhood on the next generation. However, parenting and parental psychopathology in combination with specific syndromes such as withdrawn or aggressive behavior may have a unique effect on offspring problem behavior. Similarly, parental trajectories of anxiety and attention problems in childhood may be different from trajectories of internalizing and externalizing behavior and have different associations with offspring problem behavior. We would recommend investigating the roles of parenting and parental psychopathology in adulthood in the intergenerational transmission of specific syndromes. In the same way we would recommend to test the associations between trajectories of specific problem behavior and offspring problem behavior.

In the present study, a community-based sample was used. An advantage of this type of sample is the generalizability of the results. Because the sample is community based, individuals with very severe outcomes are not well represented. This means that we have been able to investigate quite well how intergenerational transmission takes place in the general population. However, we do not know if transmission takes place in the same way in individuals with severe emotional or behavioral problems. The group of 'at risk' individuals is simply not large enough in a population-based sample to discover if their intergenerational transmission deviates from intergenerational transmission in individuals who do not have severe emotional or behavioral problems. Therefore, our investigations with regard to the occurrence and mechanisms of transmission should be replicated in an at risk sample to gain more insight in the differences between intergenerational transmission of behavior in population-based and at-risk samples.

In our studies about trajectories and mechanisms of transmission, we focused on internalizing and externalizing behavior in separate analyses. We did not test the combined effect of parental internalizing and externalizing behavior on offspring problem behavior. However, it is expected that both dimensions have an effect on the behavior of the offspring. It would be interesting to examine how these dimensions interact to influence the behavior of the offspring in future research.

Our studies on trajectories are explorative studies that should be replicated with larger samples. Although we provided theoretical explanations for our findings, future research should test our explanations empirically. Future research may for example test whether parental adult psychopathology is the mediating factor in the relation between parental increasing trajectories of internalizing problems and offspring internalizing problems. Also, it would be interesting to develop a study design in which both parents and their offspring are assessed several times in childhood. In this way we would be able to test whether trajectories themselves are inherited across generations.

References

Achenbach, T. M., McConaughy, S. H., & Howell, C. T. (1987). Child/adolescent behavioral and emotional problems: implications of cross-informant correlations for situational specificity. *Psychological Bulletin, 101*(2), 213-232.

Achenbach, T. M., & Rescorla, L. A. (2001a). *Manual for the ASEBA Preschool Forms and Profiles*. Burlington, VT: University of Vermont, Research Center for Children, Youth & Families.

Achenbach, T. M., & Rescorla, L. A. (2001b). *Manual for the ASEBA School-Age Forms and Profiles*. Burlington, VT: University of Vermont, Research Center for Children, Youth & Families.

Achenbach, T. M., & Rescorla, L. A. (2003). *Manual for the ASEBA Adult Forms and Profiles*. Burlington, VT: University of Vermont, Research Center for Children, Youth & Families.

Arrindell, W., Emmelkamp, P., Brilman, E., & Monsma, A. (1983). Psychometric evaluation of an inventory of assessment of parental rearing practices. *Acta Psychiatrica Scandinavica, 67*, 163-177.

Arrindell, W., Sanavio, E., Aguilar, G., Sica, C., Hatzichristou, C., Eisemann, M., et al. (1999). The development of a short form of the EMBU: its appreaisal with students in Greece, Guatemala, Hungary and Italy. *Personality and individual differences27*, 613-628.

Bailey, J. A., Hill, K. G., Oesterle, S., & Hawkins, J. D. (2006). Linking substance use and problem behavior across three generations. *Journal of Abnormal Child Psychology, 34*(3), 263-292.

Bailey, J. N., Ornitz, E. M., Gehricke, J. G., Gabikian, P., Russell, A. T., & Smalley, S. L. (1999). Transmission of primary nocturnal enuresis and attention deficit hyperactivity disorder. *Acta Paediatrica, 88*(12), 1364-1368.

Bartels, M., Hudziak, J. J., van den Oord, E. J., van Beijsterveldt, C. E., Rietveld, M. J., & Boomsma, D. I. (2003). Co-occurrence of aggressive behavior and rule-breaking behavior at age 12: multi-rater analyses. *Behavior Genetics, 33*(5), 607-621.

Bartels, M., van Beijsterveldt, C. E., Derks, E. M., Stroet, T. M., Polderman, T. J. C., Hudziak, J. J., et al. (2006). Young Netherlands Twin Register (Y-NTR): A Longitudinal Multiple Informant Study of Problem Behavior. *Twin Research and Human Genetics, 10*(1), 3-11.

Bartels, M., van den Oord, E. J., Hudziak, J. J., Rietveld, M. J., van Beijsterveldt, C. E., & Boomsma, D. I. (2004). Genetic and environmental mechanisms underlying stability and change in problem behaviors at ages 3, 7, 10, and 12. *Developmental Psychology, 40*(5), 852-867.

Baumrind, D. (2005). Patterns of parental authority and adolescent autonomy. *New Directions for Child and Adolescent Development* (108), 61-69.

Beidel, D. C., & Turner, S. M. (1997). At risk for anxiety: I. Psychopathology in the offspring of anxious parents. *Journal of the American Academy of Child and Adolescent Psychiatry, 36*(7), 918-924.

Belsky, J. (1984). The determinants of Parenting: a process model. *Child Development, 55*(1), 83-96.

Belsky, J., Jaffee, S. R., Sligo, J., Woodward, L., & Silva, P. A. (2005). Intergenerational transmission of warm-sensitive-stimulating parenting: a prospective study of mothers and fathers of 3-year-olds. *Child Development, 76*(2), 384-396.

Belsky, J., Pasco Fearon, R. M., & Bell, B. (2007). Parenting, attention and externalizing problems: testing mediation longitudinally, repeatedly and reciprocally. *Journal of Child Psychology and Psychiatry, 48*(12), 1233-1242.

Bergman, L. R., & El-Khouri, B. M. (2003). A person-oriented approach: methods for today and methods for tomorrow. *New Directions for Child and Adolescent Development* (101), 25-38.

Berzonsky, M. D. (2004). Identity style, parental authority, and identity commitment. *Journal of Youth and Adolescence, 33*(3), 213-220.

Bifulco, A., Moran, P. M., Ball, C., Jacobs, C., Baines, R., Bunn, A., et al. (2002). Childhood adversity, parental vulnerability and disorder: examining inter-generational transmission of risk. *Journal of Child Psychology and Psychiatry, 43*(8), 1075-1086.

Blazei, R. W., Iacono, W. G., & McGue, M. (2008). Father-Child Transmission of Antisocial Behavior: The Moderating Role of Father's Presence in the Home. *Journal of the American Academy of Child and Adolescent Psychiatry*.

Bögels, S., & van Melick, M. (2004). The relationshiop between child-report, parent self-report, and partner report of perceived parental rearing behaviors and anxiety in children and parents. *Personality and individual differences, 37*, 1583-1596.

Bongers, I. L., Koot, H. M., van der Ende, J., & Verhulst, F. C. (2004). Developmental trajectories of externalizing behaviors in childhood and adolescence. *Child Development, 75*(5), 1523-1537.

Boomsma, D. I., van Beijsterveldt, C. E., & Hudziak, J. J. (2005). Genetic and environmental influences on Anxious/Depression during childhood: a study from the Netherlands Twin Register. *Genes, Brain and Behavior, 4*(8), 466-481.

Boyle, M. H., & Willms, J. D. (2001). Multilevel modeling of hierarchical data in developmental studies. *Journal of Child Psychology and Psychiatry, 42*(1), 141-162.

Bradley, R. H., & Corwyn, R. F. (2002). Socioeconomic status and child development. *Annual Review of Psychology, 53*, 371-399.

Brendgen, M., Wanner, B., Morin, A. J., & Vitaro, F. (2005). Relations with parents and with peers, temperament, and trajectories of depressed mood during early adolescence. *Journal of Abnormal Child Psychology, 33*(5), 579-594.

Broidy, L. M., Nagin, D. S., Tremblay, R. E., Bates, J. E., Brame, B., Dodge, K. A., et al. (2003). Developmental trajectories of childhood disruptive behaviors and adolescent delinquency: a six-site, cross-national study. *Developmental Psychology, 39*(2), 222-245.

Brown, A., & Whiteside, S. (2008). Relations among perceived parental rearing behaviors, attachment style, and worry in anxious children. *Anxiety Disorders, 22*, 263-272.

Burt, K. B., Van Dulmen, M. H., Carlivati, J., Egeland, B., Sroufe, L. A., Forman, D. R., et al. (2005). Mediating links between maternal depression and offspring psychopathology: the importance of independent data. *Journal of Child Psychology and Psychiatry, 46*(5), 490-499.

Cadoret, R. J., & Cain, C. (1980). Sex differences in predictors of antisocial behavior in adoptees. *Archives of General Psychiatry, 37*(10), 1171-1175.

Cairns, R. B., Cairns, B. D., Xie, H., Leung, M. C., & Hearne, S. (1998). Paths across generations: academic competence and aggressive behaviors in young mothers and their children. *Developmental Psychology, 34*(6), 1162-1174.

Campbell, S. B., Matestic, P., von Stauffenberg, C., Mohan, R., & Kirchner, T. (2007). Trajectories of maternal depressive symptoms, maternal sensitivity, and children's functioning at school entry. *Developmental Psychology, 43*(5), 1202-1215.

Campbell, S. B., Spieker, S., Burchinal, M., & Poe, M. D. (2006). Trajectories of aggression from toddlerhood to age 9 predict academic and social functioning through age 12. *Journal of Child Psychology and Psychiatry, 47*(8), 791-800.

Capaldi, D. M., Pears, K. C., Patterson, G. R., & Owen, L. D. (2003). Continuity of parenting practices across generations in an at-risk sample: a prospective comparison of direct and mediated associations. *Journal of Abnormal Child Psychology, 31*(2), 127-142.

Caspi, A., Harrington, H., Milne, B., Amell, J. W., Theodore, R. F., & Moffitt, T. E. (2003). Children's behavioral styles at age 3 are linked to their adult personality traits at age 26. *Journal of Personality, 71*(4), 495-513.

Caspi, A., Moffitt, T. E., Newman, D. L., & Silva, P. A. (1996). Behavioral observations at age 3 years predict adult psychiatric disorders. Longitudinal evidence from a birth cohort. *Archives of General Psychiatry, 53*(11), 1033-1039.

CBS. (2001). *Standard Classification of Occupations*. Heerlen/Voorburg: Central Bureau of Statistics.

Chassin, L., Presson, C. C., Todd, M., Rose, J. S., & Sherman, S. J. (1998). Maternal socialization of adolescent smoking: the intergenerational transmission of parenting and smoking. *Developmental Psychology, 34*(6), 1189-1201.

Chen, z., & Kaplan, h. (2001). intergenerational transmission of constructive parenting. *Journal of Marriage and Family, 63*(february), 17-31.

Chronis, A. M., Lahey, B. B., Pelham, W. E., Jr., Williams, S. H., Baumann, B. L., Kipp, H., et al. (2007). Maternal depression and early positive parenting predict future conduct problems in young children with attention-deficit/hyperactivity disorder. *Developmental Psychology, 43*(1), 70-82.

Cohen, P., Kasen, S., Brook, J. S., & Hartmark, C. (1998). Behavior patterns of young children and their offspring: a two-generation study. *Developmental Psychology, 34*(6), 1202-1208.

Conger, R. D., Neppl, T., Kim, K. J., & Scaramella, L. (2003). Angry and aggressive behavior across three generations: a prospective, longitudinal study of parents and children. *Journal of Abnormal Child Psychology, 31*(2), 143-160.

Connell, A. M., & Goodman, S. H. (2002). The association between psychopathology in fathers versus mothers and children's internalizing and externalizing behavior problems: a meta-analysis. *Psychological Bulletin, 128*(5), 746-773.

Cote, S. M., Vaillancourt, T., LeBlanc, J. C., Nagin, D. S., & Tremblay, R. E. (2006). The development of physical aggression from toddlerhood to pre-adolescence: a nation wide longitudinal study of Canadian children. *Journal of Abnormal Child Psychology, 34*(1), 71-85.

D'Onofrio, B. M., Slutske, W. S., Turkheimer, E., Emery, R. E., Harden, K. P., Heath, A. C., et al. (2007). Intergenerational transmission of childhood conduct problems: a Children of Twins Study. *Archives of General Psychiatry, 64*(7), 820-829.

Decaluwe, V., Braet, C., Moens, E., & Van Vlierberghe, L. (2006). The association of parental characteristics and psychological problems in obese youngsters. *International Journal of Obesity (Lond), 30*(12), 1766-1774.

Dekker, M. C., Ferdinand, R. F., van Lang, N. D., Bongers, I. L., van der Ende, J., & Verhulst, F. C. (2007). Developmental trajectories of depressive symptoms from early childhood to late adolescence: gender differences and adult outcome. *Journal of Child Psychology and Psychiatry, 48*(7), 657-666.

Dubow, E. F., Huesmann, L. R., & Boxer, P. (2003). Theoretical and methodological considerations in cross-generational research on parenting and child aggressive behavior. *Journal of Abnormal Child Psychology, 31*(2), 185-192; discussion 201-183.

Duhig, A. M., Renk, K., Epstein, M. K., & Phares, V. (2000). Interparental agreement on internalizing, externalizing and total behavior problems: a Meta-analysis. *Clinical Psychology: Science and Practice* (7), 435-453.

Elder, G. J., & Shanahan, M. (2006). The Life Course and Human Development. In R. Lerner (Ed.), *Handbook of child psychology: Theoretical models of human development* (6 ed., Vol. 1, pp. 665-715). New York: Wiley.

Elgar, F. J., Mills, R. S., McGrath, P. J., Waschbusch, D. A., & Brownridge, D. A. (2007). Maternal and paternal depressive symptoms and child maladjustment: the mediating role of parental behavior. *Journal of Abnormal Child Psychology, 35*(6), 943-955.

Feinberg, M. E., Button, T. M., Neiderhiser, J. M., Reiss, D., & Hetherington, E. M. (2007). Parenting and adolescent antisocial behavior and depression: evidence of genotype x parenting environment interaction. *Archives of General Psychiatry, 64*(4), 457-465.

Feng, X., Shaw, D. S., & Silk, J. S. (2008). Developmental trajectories of anxiety symptoms among boys across early and middle childhood. *Journal of Abnormal Psychology, 117*(1), 32-47.

Fergusson, D. M., & Horwood, L. J. (2002). Male and female offending trajectories. *Development and psychopathology, 14*(1), 159-177.

Fergusson, D. M., Horwood, L. J., & Woodward, L. J. (2000). The stability of child abuse reports: a longitudinal study of the reporting behavior of young adults. *Psychological Medicine, 30*(3), 529-544.

Frye, A. A., & Garber, J. (2005). The relations among maternal depression, maternal criticism, and adolescents' externalizing and internalizing symptoms. *Journal of Abnormal Child Psychology, 33*(1), 1-11.

Galambos, N. L., Barker, E. T., & Almeida, D. M. (2003). Parents do matter: trajectories of change in externalizing and internalizing problems in early adolescence. *Child Development, 74*(2), 578-594.

Gilliom, M., & Shaw, D. S. (2004). Codevelopment of externalizing and internalizing problems in early childhood. *Development and Psychopathology, 16*(2), 313-333.

Goodman, S. H., & Gotlib, I. H. (1999). Risk for psychopathology in the children of depressed mothers: a developmental model for understanding mechanisms of transmission. *Psychological Review, 106*(3), 458-490.

Gruner, K., Muris, P., & Merckelbach, H. (1999). The relationship between anxious rearing behaviors and anxiety disorders symptomatology in normal children. *Journal of Behavior Therapy and Experimental Psychiatry, 30*(1), 27-35.

Hardt, J., Sidor, A., Bracko, M., & Egle, U. T. (2006). Reliability of retrospective assessments of childhood experiences in Germany. *Journal of Nervous and Mental Disease, 194*(9), 676-683.

Hardy, J. B., Astone, N. M., Brooks-Gunn, J., Shapiro, S., & Miller, T. L. (1998). Like mother, like child: intergenerational patterns of age at first birth and associations with childhood and adolescent characteristics and adult outcomes in the second generation. *Developmental Psychology, 34*(6), 1220-1232.

Herndon, R. W., & Iacono, W. G. (2005). Psychiatric disorder in the children of antisocial parents. *Psychological Medicine, 35*(12), 1815-1824.

Hetherington, E. M., Henderson, S., & Reiss, D. (1999). Family functioning and adolesecnt adjustment of siblings in nondivorced families and diverse types of stepfamilies. . *Monographs of the Society for Research in Child Development, 64*(4), 1-222.

Hofstra, M. B., Van der Ende, J., & Verhulst, F. C. (2000). Continuity and change of psychopathology from childhood into adulthood: a 14-year follow-up study. *Journal of the American Academy of Child and Adolescent Psychiatry, 39*(7), 850-858.

Holmbeck, G. N. (1997). Toward terminological, conceptual, and statistical clarity in the study of mediators and moderators: examples from the child-clinical and pediatric psychology literatures. *Journal of Consulting and Clinical Psychology, 65*(4), 599-610.

Hops, H., Davis, B., Leve, C., & Sheeber, L. (2003). Cross-generational transmission of aggressive parent behavior: a prospective, mediational examination. *Journal of Abnormal Child Psychology, 31*(2), 161-169.

Hudson, J. L., & Rapee, R. M. (2001). Parent-child interactions and anxiety disorders: an observational study. *Behavior Research and Therapy, 39*(12), 1411-1427.

Huijbregts, S. C. J., Seguin, J. R., Zoccolillo, M., Boivin, M., & Tremblay, R. E. (2008). Maternal prenatal smoking, parental antisocial behavior, and early childhood physical aggression. *Development and Psychopathology, 20*, 437-453.

Jaffee, S. R., Moffitt, T. E., Caspi, A., & Taylor, A. (2003). Life with (or without) father: the benefits of living with two biological parents depend on the father's antisocial behavior. *Child Development, 74*(1), 109-126.

Jaffee, S. R., & Price, T. S. (2007). Gene-environment correlations: a review of the evidence and implications for prevention of mental illness. *Mol Psychiatry, 12*(5), 432-442.

Johnson, J. G., Cohen, P., Chen, H., Kasen, S., & Brook, J. S. (2006). Parenting behaviors associated with risk for offspring personality disorder during adulthood. *Archives of General Psychiatry, 63*(5), 579-587.

Johnson, J. G., Cohen, P., Kasen, S., & Brook, J. S. (2006). A multiwave multi-informant study of the specificity of the association between parental and offspring psychiatric disorders. *Comprehensive Psychiatry, 47*(3), 169-177.

Johnson, J. G., Cohen, P., Kasen, S., Smailes, E., & Brook, J. S. (2001). Association of maladaptive parental behavior with psychiatric disorder among parents and their offspring. *Archives of General Psychiatry, 58*(5), 453-460.

Jung, T., & Wickrama, K. A. S. (2007). an introduction to latent class growth analysis and growth mixture modeling. *Social and Personality Psychology Compass, 2*(1), 302-317.

Kaplan, H. B., & Liu, X. (1999). *Explaining transgenerational continuity in antisocial behavior during early adolescence.* Mahwah, NJ: Erlbaum.

Keiley, M. K., Bates, J. E., Dodge, K. A., & Pettit, G. S. (2000). A cross-domain growth analysis: externalizing and internalizing behaviors during 8 years of childhood. *Journal of Abnormal Child Psychology, 28*(2), 161-179.

Kim-Cohen, J., Caspi, A., Moffitt, T. E., Harrington, H., Milne, B. J., & Poulton, R. (2003). Prior juvenile diagnoses in adults with mental disorder: developmental follow-back of a prospective-longitudinal cohort. *Archives of General Psychiatry, 60*(7), 709-717.

Kim-Cohen, J., Moffitt, T. E., Taylor, A., Pawlby, S. J., & Caspi, A. (2005). Maternal depression and children's antisocial behavior: nature and nurture effects. *Archives of General Psychiatry, 62*(2), 173-181.

Kim, J. E., Hetherington, E. M., & Reiss, D. (1999). Associations among Family Relationshiops, Antisocial Peers, and Adolescents' Externalizing Behaviors: Gender and Family Type Differences. *Child Development, 70*(5), 1209-1230.

Kruijshaar, M. E., Barendregt, J., Vos, T., de Graaf, R., Spijker, J., & Andrews, G. (2005). Lifetime prevalence estimates of major depression: an indirect estimation method and a quantification of recall bias. *European Journal of Epidemiology, 20*(1), 103-111.

Leinonen, J. A., Solantaus, T. S., & Punamaki, R. L. (2003). Parental mental health and children's adjustment: the quality of marital interaction and parenting as mediating factors. *Journal of Child Psychology and Psychiatry, 44*(2), 227-241.

Lichter, D. G., Dmochowski, J., Jackson, L. A., & Trinidad, K. S. (1999). Influence of family history on clinical expression of Tourette's syndrome. *Neurology, 52*(2), 308-316.

Lo, y., Mendell, N., & Rubin, D. (2001). Testing the number of components in a normal mixture. *Biometrika, 88*, 767-778.

Markus, M. (2003). EMBU-P. Academic Centre for Child and Adolescent Psychiatry Curium, the Netherlands

McClure, E. B., Brennan, P. A., Hammen, C., & Le Brocque, R. M. (2001). Parental anxiety disorders, child anxiety disorders, and the perceived parent-child relationship in an Australian high-risk sample. *Journal of Abnormal Child Psychology, 29*(1), 1-10.

McCord, J. (1999). Alcoholism and Crime across generations. *Criminal Behavior and Mental Health, 9*, 107-117.

McLeod, B. D., Weisz, J. R., & Wood, J. J. (2007). Examining the association between parenting and childhood depression: a meta-analysis. *Clinical Psychology Review, 27*(8), 986-1003.

McLeod, B. D., Wood, J. J., & Weisz, J. R. (2007). Examining the association between parenting and childhood anxiety: a meta-analysis. *Clinical Psychology Review, 27*(2), 155-172.

Merikangas, K. R., Dierker, L. C., & Szatmari, P. (1998). Psychopathology among offspring of parents with substance abuse and/or anxiety disorders: a high-risk study. *Journal of Child Psychology and Psychiatry, 39*(5), 711-720.

Moffitt, T. E., & Caspi, A. (2001). Childhood predictors differentiate life-course persistent and adolescence-limited antisocial pathways among males and females. *Development and Psychopathology, 13*(2), 355-375.

Moffitt, T. E., Caspi, A., Harrington, H., & Milne, B. J. (2002). Males on the life-course-persistent and adolescence-limited antisocial pathways: follow-up at age 26 years. *Development and Psychopathology, 14*(1), 179-207.

Moore, P., Whaley, S., & Sigman, M. (2004). Interactions between Mothers and Children: Impacts of Maternal and Child Anxiety. *Journal of Abnormal Psychology, 113*(3), 471-476.

Morsbach, S. K., & Prinz, R. J. (2006). Understanding and improving the validity of self-report of parenting. *Clinical Child and Family Psychology Review, 9*(1), 1-21.

Muris, P., Meesters, C., Merckelbach, H., & Hulsenbeck, P. (2000). Worry in children is related to perceived parental rearing and attachment. *Behavior Research and Therapy, 38*(5), 487-497.

Muris, P., Meesters, C., & von Brakel, A. (2003). Assessment of anxious rearing behaviors with a modified version of 'Egna Minnen Betraffande Uppfostran' questionnaire for children. *Journal of psychopathology and behavioral assessment, 25*, 229-237.

Muthèn, B., & Muthèn, L. K. from http://www.statmodel.com/chidiff.shtml

Muthèn, B., & Muthèn, L. K. (2000). Integrating person-centered and variable-centered analyses: growth mixture modeling with latent trajectory classes. *Alcohol: Clinical and Experimental Research, 24*(6), 882-891.

Muthén, L. K., & Muthén, B. O. (1998-2007). *MPlus User's Guide* (Fourth ed.). Los Angeles, CA: Muthén&Muthén.

O'Connor, T. G., Neiderhiser, J. M., Reiss, D., Hetherington, E. M., & Plomin, R. (1998). Genetic contributions to continuity, change, and co-occurrence of antisocial and depressive symptoms in adolescence. *Journal of Child Psychology and Psychiatry, 39*(3), 323-336.

Odgers, C. L., Caspi, A., Broadbent, J. M., Dickson, N., Hancox, R. J., Harrington, H., et al. (2007). Prediction of differential adult health burden by conduct problem subtypes in males. *Archives of General Psychiatry, 64*(4), 476-484.

Odgers, C. L., Moffitt, T. E., Broadbent, J. M., Dickson, N., Hancox, R. J., Harrington, H., et al. (2008). Female and male antisocial trajectories: From childhood origins to adult outcomes. *Development and Psychopathology, 20*(2), 673-716.

Offer, D., Kaiz, M., Howard, K. I., & Bennett, E. S. (2000). The altering of reported experiences. *Journal of the American Academy of Child and Adolescent Psychiatry, 39*(6), 735-742.

Pears, K. C., & Capaldi, D. M. (2001). Intergenerational transmission of abuse: a two-generational prospective study of an at-risk sample. *Child Abuse and Neglect, 25*(11), 1439-1461.

Perosa, L. M., Perosa, S. L., & Tam, P. H. (1996). The contribution of Family Structure and Differentiation to Identity Development in Females. *Journal of Youth and Adolescence, 25*(6), 817-837.

Raftery, A. E. (1995). Bayesian Model Selection in Social Research. *Sociological Methodology, 25*, 111-163.

Reiss, D., & Neiderhiser, J. M. (2000). The interplay of genetic influences and social processes in developmental theory: specific mechanisms are coming into view. *Development and Psychopathology, 12*(3), 357-374.

Reti, I. M., Samuels, J. F., Eaton, W. W., Bienvenu, O. J., 3rd, Costa, P. T., Jr., & Nestadt, G. (2002). Adult antisocial personality traits are associated with experiences of low parental care and maternal overprotection. *Acta Psychiatrica Scandinavica, 106*(2), 126-133.

Rutter, M., Moffitt, T. E., & Caspi, A. (2006). Gene-environment interplay and psychopathology: multiple varieties but real effects. *Journal of Child Psychology and Psychiatry, 47*(3-4), 226-261.

Rutter, M., & Silberg, J. (2002). Gene-environment interplay in relation to emotional and behavioral disturbance. *Annual Review of Psychology, 53*, 463-490.

Schaeffer, C. M., Petras, H., Ialongo, N., Masyn, K. E., Hubbard, S., Poduska, J., et al. (2006). A comparison of girls' and boys' aggressive-disruptive behavior trajectories across elementary school: prediction to young adult antisocial outcomes. *Journal of Consulting Clinical Psychology, 74*(3), 500-510.

Schaeffer, C. M., Petras, H., Ialongo, N., Poduska, J., & Kellam, S. (2003). Modeling growth in boys' aggressive behavior across elementary school: links to later criminal involvement, conduct disorder, and antisocial personality disorder. *Developmental Psychology, 39*(6), 1020-1035.

Serbin, L. A., Cooperman, J. M., Peters, P. L., Lehoux, P. M., Stack, D. M., & Schwartzman, A. E. (1998). Intergenerational transfer of psychosocial risk in women with childhood histories of aggression, withdrawal, or aggression and withdrawal. *Developmental Psychology, 34*(6), 1246-1262.

Serbin, L. A., & Karp, J. (2004). The intergenerational transfer of psychosocial risk: mediators of vulnerability and resilience. *Annual Review of Psychology, 55*, 333-363.

Serbin, L. A., & Stack, D. M. (1998). Introduction to the special section: studying intergenerational continuity and the transfer of risk. *Developmental Psychology, 34*(6), 1159-1161.

Shaw, D. S., Bell, R. Q., & Gilliom, M. (2000). A truly early starter model of antisocial behavior revisited. *Clinical Child and Family Psychology Review, 3*(3), 155-172.

Shaw, D. S., Gilliom, M., Ingoldsby, E. M., & Nagin, D. S. (2003). Trajectories leading to school-age conduct problems. *Developmental Psychology, 39*(2), 189-200.

Shaw, D. S., Winslow, E. B., Owens, E. B., Vondra, J. I., Cohn, J. F., & Bell, R. Q. (1998). The development of early externalizing problems among children from low-income families: a transformational perspective. *Journal of Abnormal Child Psychology, 26*(2), 95-107.

Simons, R. L., Chao, W., & Conger, R. D. (2001). Quality of parenting as mediator of the effect of childhood defiance on adolescent friendship choices and delinquency: a growth curve analysis. *Journal of marriage and family, 63*, 63-79.

Simons, R. L., Johnson, C., Conger, R. D., & Elder, G. J. (1998). A test of latent trait versus life course perspectives on the stability of adolescent antisocial behavior. *Criminology, 36*, 217-243.

Smith, C. A., & Farrington, D. P. (2004). Continuities in antisocial behavior and parenting across three generations. *Journal of Child Psychology and Psychiatry, 45*(2), 230-247.

Smits, I., Soenens, B., Luyckx, K., Duriez, B., Berzonsky, M., & Goossens, L. (2008). Perceived parenting dimensions and identity styles: exploring the socialization of adolescents' processing of identity-relevant information. *Journal of Adolescence, 31*(2), 151-164.

Snyder, J., Cramer, A., Afrank, J., & Patterson, G. R. (2005). The contributions of ineffective discipline and parental hostile attributions of child misbehavior to the development of conduct problems at home and school. *Developmental Psychology, 41*(1), 30-41.

Sobel, M. E. (1982). Asymptotic confidence intervals for indirect effects in structural equation models In S.Leinhardt (Ed.), *Social methodology 1982* (pp. 290-312). Washington, DC: American Sociological Association.

Sterba, S. K., Prinstein, M. J., & Cox, M. J. (2007). Trajectories of internalizing problems across childhood: heterogeneity, external validity, and gender differences. *Development and Psychopathology, 19*(2), 345-366.

Stoolmiller, M., Kim, H. K., & Capaldi, D. M. (2005). The course of depressive symptoms in men from early adolescence to young adulthood: identifying latent trajectories and early predictors. *Journal of Abnormal Psychology, 114*(3), 331-345.

Thapar, A., Harold, G., Rice, F., Langley, K., & O'Donovan, M. (2007). The contribution of gene-environment interaction to psychopathology. *Development and Psychopathology, 19*(4), 989-1004.

Thornberry, T. P., Freeman-Gallant, A., Lizotte, A. J., Krohn, M. D., & Smith, C. A. (2003). Linked lives: the intergenerational transmission of antisocial behavior. *Journal of Abnormal Child Psychology, 31*(2), 171-184.

Tick, N. T., van der Ende, J., & Verhulst, F. C. (2007). Twenty-year trends in emotional and behavioral problems in Dutch children in a changing society. *Acta Psychiatrica Scandinavica, 116*(6), 473-482.

Trentacosta, C. J., & Shaw, D. S. (2008). Maternal predictors of rejecting parenting and early adolescent antisocial behavior. *Journal of Abnormal Child Psychology, 36*(2), 247-259.

van der Valk, J. C., Van den Oord, E. J. C. G., Verhulst, F. C., & Boomsma, D. I. (2003). Genetic and Environmental Contributions to Stability and Change in Children's Internalizing and Externalizing Problems. *Journal of the American Academy of Child and Adolescent Psychiatry, 42*, 1212-1220.

van Meurs, I., Reef, J., Verhulst, F. C., & Van der Ende, J. (*In Press*). Intergenerational transmission of child behavior; a longitudinal, population-based study. *Journal of the American Academy of Child and Adolescent Psychiatry*.

Verhulst, F., Van der Ende, J., & Koot, H. (1996). *Handleiding voor de CBCL/4-18 (Manual for the CBCL/4-18)*. Rotterdam: Erasmus University/Department of Child and Adolescent Psychiatry, Sophia Children's Hospital.

Verhulst, F. C., Akkerhuis, G. W., & Althaus, M. (1985). Mental health in Dutch children: I.A cross-cultural comparison. *Acta Psychiatrica Scandinavica Supplement*(323), 1-108.

Verhulst, F. C., Berden, G. M., & Sanders-Woudstra, J. A. R. (1985). Mental health in Dutch children: II. The prevalence of psychatric disorder and relationship between measures. *Acta Psychiatrica Scandinavica Supplement*(324).

Verhulst, F. C., van der Ende, J., Ferdinand, R. F., & Kasius, M. C. (1997). The prevalence of DSM-III-R diagnoses in a national sample of Dutch adolescents. *Archives of General Psychiatry, 54*(4), 329-336.

von Eye, A., & Bergman, L. R. (2003). Research strategies in developmental psychopathology: dimensional identity and the person-oriented approach. *Development and Psychopathology, 15*(3), 553-580.

Weissman, M. M., Wickramaratne, P., Nomura, Y., Warner, V., Pilowsky, D., & Verdeli, H. (2006). Offspring of depressed parents: 20 years later. *The American Journal of Psychiatry, 163*(6), 1001-1008.

Samenvatting

Het doel van dit proefschrift was het onderzoeken van intergenerationele overdracht van emotionele- en gedragsproblemen. In **hoofdstuk 1** werd een algemene introductie van de huidige studie gegeven. De doelen van onze studie waren drievoudig: 1) In welke mate gaat probleemgedrag in de kindertijd over op de volgende generatie? 2) Welke rol spelen huidig probleemgedrag van ouders en opvoeding in de intergenerationele transmissie van probleemgedrag bij kinderen? 3) Voorspellen ouderlijke ontwikkelingstrajecten van internaliserend en externaliserend gedrag het internaliserend en externaliserend gedrag van hun kinderen? Informatie over het probleemgedrag van ouders in hun kindertijd en het probleemgedrag van hun kinderen werd verzameld in een bevolkingsstudie waarvan de metingen op verschillende momenten plaatsvonden, verspreid over 24 jaar.

In **hoofdstuk 2** vergeleken we probleemgedrag van ouders in hun kindertijd met het probleemgedrag van hun kinderen 24 jaar later. We onderzochten verschillende soorten probleemgedrag. De meeste soorten probleemgedrag bij kinderen werden voorspeld door het gedrag van hun ouders toen zij kinderen waren. Het internaliserende, externaliserende en totaalprobleemgedrag van ouders in hun kindertijd voorspelden soortgelijke problemen bij hun eigen kinderen. Sekse verschillen werden gevonden voor delinquent gedrag: overdracht van problemen was sterker bij moeders dan bij vaders, en het was sterker bij zoons dan bij dochters.

Om inzicht te krijgen in de etiologie van intergenerationele overdracht van probleemgedrag in de kindertijd werden in **hoofdstuk 3** huidig probleemgedrag bij de ouders en opvoeding onderzocht als mogelijke factoren om de associaties tussen twee generaties kindgedrag te verklaren. De resultaten van deze studie toonden aan dat alleen huidig probleemgedrag van ouders de associaties tussen twee generaties probleemgedrag bij kinderen verklaarde, maar dat huidig probleemgedrag van ouders en opvoeding beide probleemgedrag bij kinderen voorspelden. Opvoeding wordt op haar beurt voorspeld door huidig probleemgedrag van ouders. Deze resultaten geven aan dat toekomstig onderzoek beide factoren zou moeten meenemen als aparte risicofactoren.

In **hoofdstuk 4** hebben we onderzoek gedaan naar de rol van de opvoeddimensies afwijzing en overprotectie in de intergenerationele overdracht van externaliserend gedrag. Overdracht van afwijzing en overprotectie speelden een significante rol in de ontwikkeling van externaliserend gedrag. Beide opvoeddimensies voorspelden hogere niveaus van externaliserend gedrag in twee generaties. Afwijzing werd indirect overgedragen naar de volgende generatie, via externaliserend gedrag van de ouder. Er was een direct verband tussen overprotectie in twee generaties. Deze resultaten in ogenschouw nemend, kunnen we concluderen dat verschillende opvoeddimensies verschillen in hun voorspellers en effecten met betrekking tot de intergenerationele transmissie van externaliserend gedrag. Het is belangrijk om hier rekening mee te houden in onderzoek en klinische praktijk.

Bestaand onderzoek naar intergenerationele overdracht van probleemgedrag heeft met name probleemgedrag van ouders op een enkel punt in de tijd vergeleken met het probleemgedrag van hun kinderen. Met de ontwikkeling van probleemgedrag bij ouders wordt op deze manier geen rekening gehouden. In de **hoofdstukken 5 en 6** worden verbanden tussen de ontwikkeling van ouderlijk probleemgedrag tijdens kindertijd en adolescentie, en het probleemgedrag van kinderen onderzocht.

In **hoofdstuk 5** worden de verbanden tussen de ontwikkeling van internaliserend gedrag bij ouders, en het internaliserend en externaliserend gedrag bij kinderen beschreven. Toenemende en afnemende trajecten van internaliserend gedrag voorspelden meer internaliserende problemen bij kinderen. Alleen het dalende traject van moeders voorspelde meer externaliserende problemen bij kinderen.

In **hoofdstuk 6** worden de verbanden tussen de ontwikkeling van externaliserend gedrag bij ouders, en het internaliserend en externaliserend gedrag bij kinderen beschreven. Uit onze analyses bleek dat de ontwikkeling van externaliserend gedrag het best kon worden beschreven met aparte trajecten voor mannen en vrouwen. De trajecten voor mannen voorspelden het probleemgedrag van hun kinderen niet. Het adolescentie-stijgende traject voorspelde meer internaliserend en externaliserend gedrag bij kinderen. Het dalende traject voorspelde meer externaliserend gedrag bij zoons. De resultaten van deze studies geven aan dat verbanden tussen probleemgedrag van ouder en kind verschillen tussen de trajecten die ouders volgen. De ontwikkeling van ouderlijk probleemgedrag zou in overweging moeten worden genomen wanneer men verbanden tussen het gedrag van ouders en kinderen wil voorspellen.

In **hoofdstuk 7** worden de belangrijkste bevindingen van dit proefschrift samengevat en besproken. Er wordt beschreven dat de huidige studie ons leert dat een breed scala aan verschillende probleemgedragingen bij kinderen wordt overgedragen naar een volgende generatie en dat ouderlijk probleemgedrag en opvoeding een belangrijke rol spelen in deze intergenerationele overdracht. Verder vonden we dat de ontwikkeling van internaliserend en externaliserend gedrag bij ouders in de kindertijd verband houdt met het probleemgedrag van hun eigen kinderen. Tot slot worden de tekortkomingen van het onderzoek besproken en worden aanbevelingen gedaan voor toekomstig onderzoek.

Summary

The objective of this thesis was to investigate the intergenerational transmission of child problem behavior. In **chapter 1**, a general introduction to the present study was given. The aims of the study were threefold: 1) To what extent do different types of problem behaviors continue across generations? 2) What role do current parental problem behavior and parenting play in the intergenerational transmission of problem behavior? 3) Do parental trajectories of internalizing and externalizing problem behavior predict offspring internalizing and externalizing behavior? Data on the child problem behavior of parents and their offspring were collected in a community-based sample that was assessed at multiple time-points over a 24-year period.

In **chapter 2**, we compared problem behavior of parents in their childhood, to the problem behavior of their offspring 24 years later. We investigated a broad range of child problem behaviors. Most forms of problem behavior in children were predicted by the behavior of their parents as children. Parents' internalizing, externalizing and total problem scores in childhood all predicted similar problems in their children. Sex differences were found for delinquent behavior: continuity was stronger in mothers than it was in fathers, and it was also stronger in sons than in daughters.

To provide insight in the etiology of intergenerational transmission of child problem behavior, current parental psychopathology and parenting were investigated as possible factors to explain this transmission in **chapter 3**. The results of this study showed that only current parental problem behavior explained the associations between two generations of child problem behavior, but current parental problem behavior and parenting both predicted child problem behavior. Parenting itself was predicted by current parental problem behavior. These results indicated that future studies should take both factors into account as separate risk factors.

In **chapter 4**, we examined the role of two different parenting dimensions, rejection

and overprotection, in the intergenerational transmission of behavior. Transmission of rejection and overprotection was found to play a significant role in the development of externalizing behavior. Both parenting dimensions predicted higher levels of offspring externalizing behavior in two generations. Rejection was transmitted indirectly, through parental externalizing behavior. In contrast, overprotection was transmitted directly. Considering these results, different parenting dimensions may have different precursors and effects in the intergenerational transmission of externalizing behavior. It is important to be aware of this in research as well as in clinical settings.

Research on the intergenerational transmission of problem behavior has mainly compared parental problem behavior at a single point in time with offspring problem behavior. The parental development of problem behavior has not yet been taken into account. In **chapters 5 and 6**, associations between parental development of problem behavior during childhood

and adolescence, and offspring problem behavior were investigated. In **chapter 5**, the associations between parental development of internalizing problems during childhood and adolescence, and offspring internalizing and externalizing problems were investigated. The increasing and decreasing trajectories of internalizing problems predicted elevated levels of internalizing problems in offspring significantly. Only the decreasing trajectory of mothers predicted elevated levels of externalizing behavior. In **chapter 6**, the associations between parental development of externalizing problems during childhood and adolescence, and offspring internalizing and externalizing problems were investigated. The analyses yielded separate trajectories for males and females. Trajectories for males did not predict the level of offspring problem behavior. The female adolescent-increasing trajectory predicted elevated levels of offspring externalizing and internalizing behavior, compared to the low group. The female decreasing trajectory predicted elevated levels of offspring externalizing behavior only in boys. The results of these studies indicate that associations between parent and offspring problem behavior differ across parental trajectories of internalizing problems. The development of parental problem behavior should be taken into account when predicting offspring problem behavior.

In **chapter 7**, the main findings of this thesis are summarized and discussed. The present study shows that a broad range of different child problem behavior are transmitted across generations. Adult problem behavior and parenting each play an important role in this intergenerational transmission. Furthermore, we found that the development of childhood internalizing and externalizing behavior in parents is associated with offspring problem behaviors as well. Finally, limitations of the present study and implications for future research are discussed.

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Een proefschrift kan niet geschreven worden zonder de steun en inzet van vele mensen. In dit dankwoord wil ik het woord richten tot hen die het ontstaan van dit proefschrift mogelijk hebben gemaakt.

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Curriculum Vitae

Inge van Meurs werd geboren op 2 juli 1979 te Leerdam. In juni 1997 behaalde zij haar Gymnasiumdiploma aan het Emmauscollege te Rotterdam. Van september 1997 tot juli 1998 studeerde zij Japanologie aan de Universiteit van Leiden, waarin zij haar propedeuse behaalde. In september 1998 begon zij aan een studie psychologie. Zij koos voor de richting ontwikkelings- en onderwijspsychologie en liep tijdens haar studie een jaar stage bij de Kinder- en Jeugd GGZ van de Rijngeestgroep te Leiden. Haar afstudeeronderzoek betrof het verband tussen eetstoornissen en persoonlijkheidsproblematiek, in samenwerking met de Rijngeestgroep en de Robert Fleury stichting. In maart 2003 studeerde zij Cum Laude af. Aansluitend deed zij drie maanden vrijwilligerswerk in Nepal. Daarna was zij ongeveer een jaar werkzaam als ambulant hulpverlener bij Bureau Jeugdzorg Zuid-Holland Noord. In juli 2004 vertrok zij opnieuw naar Azië, ditmaal voor een zes maanden durende reis door India, Indonesië en Thailand. Na haar terugkomst werd zij aangesteld bij de afdeling Kinder- en Jeugdpsychiatrie van het Erasmus Medisch Centrum te Rotterdam, waar zij van juni 2005 tot februari 2009 het promotieonderzoek uitvoerde waarvan de resultaten in dit proefschrift staan beschreven. Sinds februari 2009 werkt zij als onderzoeker en adviseur voor adviesbureau Van Montfoort.